ELECTRICAL REVIEW

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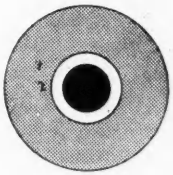

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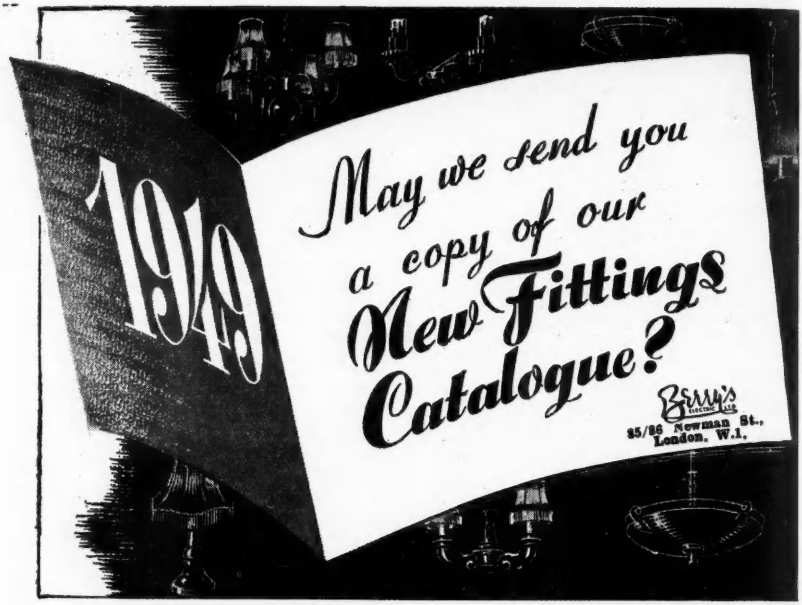

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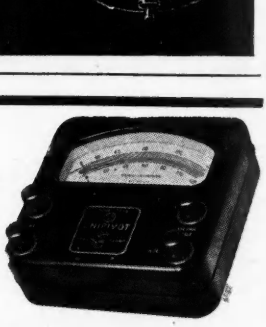

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THE OLDEST ELECTRICAL PAPER

ELECTRICAL REVIEW

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Future Development

E.D.A.'s ROLE STILL UNSETTLED

ELECTRICITY consumption has continued to rise in the past nine years in spite of official discouragement, but there is no doubt that that discouragement, justified though it may have been, has done the electricity supply industry much harm. People have been forced to adopt other, less efficient, methods and the process continues.

Because of the power plant situation there has been a tendency to question the desirability of an electrical development organization. We had the impression that that was the view of the Ministry of Fuel and Power, but Mr. Gaitskell's speech at the E.D.A. luncheon seems to have revealed either that we were wrong or that the Ministry has changed its mind.

Definite Change of Policy

The Minister was obviously elated at his ability to announce the lifting of the lighting restrictions and thus to give the lie to the suggestion that the Government revels in "austerity." But he went further in announcing a "definite change of policy." The full use of electricity outside peak hours could now be permitted and the consumer would have a free choice. The aim of the electricity industry, he said, must now be to use its plant to the best advantage by selling more electricity at the right time, and in this the personal touch of the British Electrical Development Association would be of immense advantage. There would be great scope for electrical development in the home and in agriculture.

This testimony to the value of the Association was deserved, and it was followed up by Lord Citrine. He mentioned the possibility of overlapping between the Boards and E.D.A., which would necessitate consideration of E.D.A.'s area activities. Some greater measure of integration might be necessary, and Lord Citrine said that the past year's experience would be a valuable guide in enabling the Boards to determine their final policy. He was convinced that, whatever might be the outcome in the sphere of area organization, every effort would be made to avoid disrupting or weakening E.D.A. as a national entity.

This was the nearest approach to an indication of E.D.A.'s future made at the luncheon or the annual meeting. It is generally accepted that there must be a development organization of some kind, but the form and governance are in question.

National or Local?

It rather looks as though the B.E.A. favours a national arrangement with a headquarters in London and branches in the areas: something like the present system, in fact. On the other hand, some of the Boards, jealous for their autonomy, may want their separate area organizations, more or less self contained, with or without a central association to which they would subscribe and upon which they could call for a number of services best performed nationally.

The possibility of overlapping or duplication under the present dispensation should not be regarded too seriously. There were few, if any, complaints of this when E.D.A. was serving three or four hundred separate members. Rein-

forcement is not to be regarded as duplication.

If the present structure were retained, surely the Boards would be able to exercise sufficient influence upon the Area Committees (which they would presumably appoint) to ensure that their ideas were implemented. We cannot see the usefulness of creating a series of entirely independent area development organizations which, in any event, would have to operate largely upon those lines which E.D.A. has evolved in its nearly thirty years' experience. That experience is possessed by a competent staff whose services are invaluable and who could not be easily replaced if they were split up.

We cannot but hope that the E.D.A. national service will be retained, together with its area organization, reinforced as considered necessary by the Electricity Boards.

MORE LIGHT

GRATITUDE to Mr. Gaitskell for relaxing the lighting regulations is somewhat tempered by the reflection that it might have been done before. It is true that some extra coal will be consumed as a result, but it is the sort of coal which nobody but the supply authorities can use. Nevertheless, the "concession" is a welcome one both to the public and the electrical industry, and much credit is due to the Electrical Sign Manufacturers' Association which led the agitation for more light. It means the resuscitation of an industry which has suffered more than most from the wartime black-out and post-war austerity. We are certain that the effect of the extra light upon the public will be most beneficial, and by no means conducive to the wasteful use of electricity as the "psychologists" have hitherto feared.

OVERSEAS APPRENTICES

FOR many years it has been realized that it was a sound idea to encourage young men from overseas to serve apprenticeships with British manufacturers. Their absorption of British ideas and practice is likely to provide a valuable contribution to international friendship and trade. Several electrical manufacturers have done a good deal in this way, and now the Treasury is taking a hand The Federation of British Industries has evolved a scheme for awarding scholarships to overseas students to enable them to complete their studies here. It is estimated that the cost of maintaining them will be £650 for two years, and firms desiring to participate in the scheme will be expected to guarantee £450 of this, the Treasury making up the rest of the cost. One provision is that generally the scholarships will be available only to students from countries in relatively early stage of industrial development.

COAL COST

ALTHOUGH oil became the major interest of Lord Cadman's maturer years, he commenced his career in coal. Indeed, as John Cadman, he was Inspector of Mines nearly fifty years ago. It is, therefore, appropriate that the second of the Cadman Memorial Lectures, last week at the Royal Society of Arts, should have been delivered by two such well-known Fifeshire mining engineers as Sir Charles and Dr. William Reid, and of interest, too, as the first occasion on which father and son have collaborated to lecture on their own industry. To do so meant some compromise of individual thought and adjustment of personal views on the subject, but they believe that reconstruction can raise coal output per manshift from 21.8 cwt in 1948 to 30 cwt in 1965. That would reduce by 5s the cost of producing each ton of coal, but it will involve a capital expenditure of £300 millions during the intervening fifteen years.

COLLIERY POWER

ONE of the savings allowed for when making the above forecast will result from more economical use of inbrought power and the more efficient generation and use of steam by the mines themselves, 6d a ton being suggested. It seems safe to assume that part of the existing steam-raising plant at individual collieries will be replaced by inbrought electrical power, thus saving manpower, but the important question whether the low-grade fuel thereby released is to be utilized by the N.C.B. or the B.E.A. still remains to be settled.

Electrical Development

RECONSTITUTED ASSOCIATION'S FIRST MEETING

AT the Connaught Rooms, London, W.C., on 18th March, the British Electrical Development Association held its first annual luncheon and meeting since the taking over of the electricity supply industry by the British Electricity Authority. The gathering of 520 included many distinguished guests; representatives of the B.E.A. and Electricity Boards replaced the former local authority and company delegates.

Lord Citrine, chairman of the B.E.A. and president of the Association, was in the chair and the principal guest was the Rt. Hon. Hugh Gaitskell, Minister of Fuel and Power, to whom fell the task of proposing the first toast—"Electrical Development." Mr. Gaitskell began his speech by announcing the relaxations upon public lighting which he had set out that morning in a written reply to a question in the Commons. Details of this are given in another page of this issue.

He said that he was very glad to have been able to remove those irksome restrictions but he had not found it possible to do so until we had got through the winter. Although stocks of coal generally were at a lower level than a year ago the power stations had more. He had chosen 2nd April as the date of relaxation because it was the day before Summer Time began and it was a Saturday. He thought a minor type of celebration would be in order on this occasion.

Mr. Gaitskell emphasized that there was still insufficient good coal available to meet both home and export demands, but the quantity of untreated smalls was now greater. The B.E.A. had undertaken that the extra half a million tons which the relaxation would require would be in the form of untreated smalls.

The concession led to a definite change of policy. The use of electricity had had to be discouraged not only at peak periods but at

Mr. V. W. Dale (general manager and secretary, E.D.A.) Lord Citrine (president), Mr. Hugh Gaitskell (Minister of Fuel and Power) and Mr. J. Eccles (chairman, E.D.A. Council)

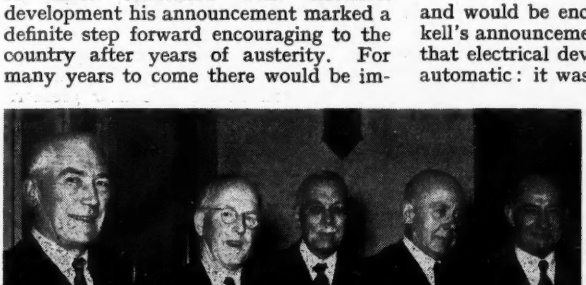
Lady Citrine, Mr. L. Silkin (Minister of Town and Country Planning) and Mr. C. W. Key (Minister of Works)

Sir Geoffrey Heyworth (Lever Bros., Ltd.), Dame Caroline Haslett Lord Hyndley (Chairman, National Coal Board) and Sir Cyril Hurcomb (chairman, British Transport Commission)

all times because of the coal situation. Nevertheless consumption had continued to rise, thanks to the past efforts of the British Electrical Development Association. Now we had reached the stage at which the full use of electricity outside peak hours could be permitted. It had to be remembered that the peak problem would be as serious next winter as it had been this winter. Even if the full plant programme of 1,000 MW was achieved there would still be barely sufficient plant to keep pace with the demand. The B.E.A. would need all the assistance of those responsible to get its generating plant programme through.

Thus the problem facing the industry for the next few years was to sell more electricity at the right time: to obtain a better load factor not to increase the maximum load on the power stations. It was the right financial policy too. If the consumer was to get his electricity cheaper the available equipment had to be used as intensively as possible.

The personal touch of E.D.A. in handling the consumer could be of immense advantage to the industry. Particularly to those concerned with electrical development his announcement marked a definite step forward encouraging to the country after years of austerity. For many years to come there would be immense scope for electrical development in the home. A second line of development lay in agriculture and horticulture. This was pre-eminently in the national interest but progress depended on how fast the Electricity Boards were able to press on with their programmes of rural distribution.



Mr. G. A. Vowles, Mr. E. Jones, Mr. A. C. Cramb (former director of E.D.A.), Mr. J. T. H. Legge and Mr. V. A. Pask (chief engineer, B.E.A.)

The difficult job of the Ministry of Fuel and Power was to hold the balance evenly between coal, gas and electricity. The right fuel policy was to give the public full freedom of choice and to ensure full and free competition between the industries concerned. Consumers must be made aware of the possibilities and costs of each method but charges should truly correspond to the actual cost of supply. On that basis and given a fair chance electricity had nothing to fear.

Responding to the toast, Lord Citrine said that the industry was grateful for, and would be encouraged by, Mr. Gaitskell's announcement. He went on to say that electrical development had not been automatic: it was the result of hard and unremitting work of a body of people who, from the earliest days of the industry, had striven to give the public a broader conception of the myriad uses of electricity. Their efforts had resulted in the acceptance of electricity as a vital force in the life of the nation.

Ald. Sir William Walker, Mr. H. Evans and Ald. A. Hewitt

That had not been brought about merely by extolling the merits of electricity. There had been sustained planning and effort and the expenditure of great sums upon advertising campaigns involving many kinds of activities.

Those present would be asking whether such developments were to continue and what part E.D.A. was likely to play in

those developments. He could say that in spite of the present irritating restrictions development would continue; he welcomed the Minister's statement as a first step on the road to the removal of restrictions. But most of those restrictions were the result of the shortage of

Sir Charles Darwin (director, N.P.L.) Sir Johnstone Wright and Sir Vincent de Ferranti

generating plant. To the question when the industry would be able to meet the full needs of consumers he was bound to reply that on present signs there was no prospect of this until 1953.

There had been a tendency to set unduly high targets for additional capacity, having regard to the amount of labour and materials available. Consequently although the Authority was authorized to commission 1,150 MW in 1948, actually only 566 MW was obtained, although this was slightly more than the pre-war average.

An attempt had now been made to produce more realistic figures. The estimate for 1949 had been reduced from 1,600 MW to 996 MW and the revised figures for 1950 and 1951 were 1,150 MW and 1,556 MW respectively. Deliveries would have to be substantially above those figures if they were to keep pace with the load without retaining in service an unduly large proportion of plant over 25 years old. At present they were using 614 MW of obsolescent plant; it might rise to as much as 1,624 MW by the end of 1953.

It was recognized that even the reduced figure of 996 MW for 1949 would be hard to achieve: the highest amount ever installed in one year was 766 MW in 1938. Despite the care with which the estimates were prepared (every single station and set being examined) he had an uneasy feeling from reports which he received that the estimate for the year might not be achieved. He hoped that he was mistaken but when he read that, on a particular site, instead of seven boilers being commissioned during the year the makers could now guarantee only two, his concern would be understood.

The causes of this situation were complex and it was difficult to blame anyone—least of all the B.E.A. which inherited the position. Despite valiant efforts to maintain a proper balance between civil engineering and manufacturing, bottlenecks and shortages of labour and materials were continually hampering the realization of the programme. Boilers, tubes and pipework were the greatest problem, but the manufacturers of these and of heavy electrical plant were required to export up to nearly 40 per cent of their output in order that the country might be provided with food, clothing and raw materials.

In these circumstances what prospects were there of British industry embarking upon the vast re-equipment which was necessary to enable it to compete with other countries, particularly with the United States whose workers had 2½

Mr. F. Newey, Mr. Harold Hobson and Sir George Nelson (chairman, B.E.A.M.A.)

times the h.p. per head that our workers possessed?

He had many times heard concern expressed at the exceptionally high rate of export of heavy electrical and boiler plant. Undoubtedly there was a feeling that we were equipping our potential competitors for a struggle which might come at any time when our own industries were at a comparative disadvantage.

Clearly there was much scope for electrical development ahead and intricate as

the problems were he hoped that means would be found to facilitate the natural expansion of the virile electrical industry which was justified by its importance in the life of the country.

Turning to the future of E.D.A., Lord Citrine said that on vesting day the Association was firmly and unchallengeably established as a co-ordinating medium ready for such use as the Electricity Boards wished to make of it. It was hoped then that it would be possible to avoid sweeping changes although there were inevitable alterations in the Association's constitution and in the personnel of its Council and committees. After vesting day, membership was necessarily limited to the B.E.A., the fourteen Area Boards, the North of Scotland Board and certain authorized undertakings in Northern Ireland. A number of the Dominion undertakings remained enrolled as subscribers. A real effort was made to secure continuity of the membership of the twelve committees of the Association.

It had been found that there was a possibility of duplication of work as between the B.E.A. and the Association, both at their headquarters and in the areas. This overlapping had been kept to a minimum but it still had to be considered how the activities at present being carried on by E.D.A. in the areas could best be performed.

Possible "Integration"

Some greater measure of integration might be necessary and the past year's experience would provide valuable guidance in enabling the Electricity Boards to shape their final policy. But whatever might be the outcome he was convinced that every effort would be made to avoid disrupting or weakening E.D.A. as a national entity and as a valuable factor in spreading knowledge of the electrical industry and extending its influence.

The health of the guests was proposed by Mr. J. Eccles, chairman of the Council, in a most felicitous speech. He welcomed Mr. Gaitskell, Mr. C. W. Key, Minister of Works, and Mr. L. Silkin, Minister of Town and Country Planning, and made special reference to a number of the eminent men also present. He impressed upon the company the fact that electrical development was synonymous with Great Britain's prosperity. He asked the contractors who were building the new power stations to make this a record year of construction. The civil engineering contractors especially should bear in mind that they were not only providing the foundations of power stations but the very foundations of our national prosperity and security.

Sir Geoffrey Heyworth (chairman, Lever Bros., Ltd., and of the committee on the Gas Industry) acknowledged the toast and mentioned as an example of electrical development the fact that in the 1,200 houses at Port Sunlight the average annual consumption was 1,560 kWh.

ANNUAL MEETING

The annual general meeting followed immediately after the luncheon, Mr. J. Eccles presiding.

Mr. E. R. Wilkinson (chairman, Finance Committee), presenting the accounts, said that subscriptions last year were £10,000 higher. Press advertising had been restricted but expenditure on exhibitions and displays increased by £10,000, largely because many more agricultural shows were resumed. Expenditure on Building Centres included the cost of the construction of the new electrical section of the London Centre, opened in December last. Equipment to the value of £10,724 was delivered to domestic science training colleges, as compared with £5,203 in 1947; about three-quarters of the total amount had now been delivered, and it was expected that the scheme would be completed in the current year. Rent, lighting and heating had increased due to the lease of additional offices at 9, Savoy Street, for the E.D.A. Testing House.

The chairman reported that Lord Citrine had accepted office as president of the Association for 1949-1950, and that Dr. P. Dunsheath and Sir Cyril Hurcomb had been elected vice-presidents for 1949-1952.

Mr. Eccles then presented the annual report of the Council for 1948 and briefly reviewed the principal contents. He pointed to various changes, due to the nationalization of the industry, which had resulted in the membership now consisting of 18 or 19 members instead of the 340 members previously. He emphasized that the Association had been able to maintain contacts with Government Departments in a manner which would not have been possible or proper in the case of the Area Boards or even the British Electricity Authority. Stress was also laid on the value of the public speaking competition and the general educational work of the

Association, and the hope was expressed that Area Boards would follow up the installation of the electrical equipment of the colleges by suitable maintenance.

The Testing House was in operation and there was a joint B.S.I. and E.D.A. Committee to deal with specifications for electrical apparatus. This was another step forward in the prevention of shoddy workmanship and shoddy apparatus. In every case of unsuitable appliances the manufacturers either withdrew the apparatus or took steps to rectify it. There was an increasing demand for E.D.A. films; the film "Men of Merit" was so produced that the Cinematograph Exhibitors' Association agreed to give it free distribution.

Lord Citrine's Work

The chairman, proposing a vote of thanks to Lord Citrine for his services as president during the past year, said that only those who had been associated with the B.E.A. since its inception had any idea of the amount of work which Lord Citrine had done since he first met him in May, 1947. He was a man of terrific energy and a man who would not accept anything unless he understood it. Mr. S. F. Steward seconded the vote of thanks, which was cordially given.

Lord Citrine said that during the past year he had had immense help in the things he had had to do with regard to the Association mainly from Mr. Eccles and Mr. V. W. Dale. It was essential to sell more electricity if the huge capital programme involved was to be financed. Unless means could be found for selling vastly increased amounts of electricity over and above what had been the case, it meant that the present tariffs would have to be adjusted to meet the very much heavier cost of plant. Precisely why plant was costing so much, puzzled some of them. There were some quite evident reasons which could be understood but there was still something that was not quite fully explained. Why was it that boiler plant and coal handling plant, for instance, cost four times what it did in pre-war days? Talks were now taking place in a friendly atmosphere with the manufacturers and others and he hoped it would be possible to secure elucidation of that point, and perhaps some adjustment also.

He had tried to pursue in the industry one very simple policy. It was that if people were going to work well they must be happy people.

Referring to the E.D.A., he said that at the luncheon he had tried to give a cautious impression of his own personal views and had tried to indicate that it should not be regarded as a foregone conclusion that an Association of this kind was at the end of its utility merely because the industry had become nationalized. It would be necessary during the ensuing months to find the proper answer to that kind of problem.

Mr. R. A. S. Thwaites (vice-chairman), proposing a vote of thanks to the retiring chairman (Mr. Eccles) spoke of the great contribution he had made to electrical development generally and of the manner in which he had contributed to the smooth transition of the industry to State ownership as a member of the Organizing Committee. Mr. H. F. Carpenter (Secretary, B.E.A.) seconded the motion.

Mr. Eccles said that the real work of the Association was done behind the scenes, and the power behind the scenes was Mr. Dale, the general manager and secretary, and his staff.

The final vote of thanks was to the chairmen, vice-chairmen and members of E.D.A. committees, and to the technical Press, which was proposed by Mr. C. T. Melling and seconded by Mr. E. R. Wilkinson.

ANNUAL REPORT

The twenty-ninth annual report, covering the past year, refers to the amendment of the Articles of Association in March, 1948, to provide that membership should consist of the B.E.A., the fourteen Electricity Boards, the North of Scotland Hydro-Electric Board and the authorized undertakings in Northern Ireland. The new Council took office on 1st April with Mr. J. Eccles as chairman and Mr. R. A. S. Thwaites as vice-chairman, Lord Citrine being elected president. The regulations governing the Area Committees were revised to make the areas co-extensive with Electricity Areas and committees were appointed—in five cases for combined Areas. Special committees were reappointed, and it was decided to maintain the Association's representation on other bodies. Subscriptions were so arranged that the revenue from this source remained at £160,000.

The rest of the report follows the customary lines, dealing briefly with the various departments of the Association's activities —press, films (four new educational films, an agricultural film, "Clean Milk Production," and the popular "Men of Merit" were produced), exhibitions, agricultural shows, commercial development, the Testing House, equipment of domestic science training colleges, educational activities, and relations with other organizations. Reports of the work of the ten Area Committees, the Electric Vehicle Association and the Electrical Association for Women, are appended to the main report.

It is seen that there are now about 40 Dominion and foreign subscribers, additions

during the year being the Uganda Electricity Board, the Southern Rhodesia Electricity Supply Commission, and the Gibraltar City Council.

Among outstanding matters in the report is a reference to representations made to the Chancellor of the Exchequer urging a reduction in the purchase tax on water heaters. Disapproval was expressed by the Council of a proposal that electrical appliances submitted to the Housing Supplies Department of the Ministry of Works should be tested by the chief inspector of elctrical and mechanical equipment. As a result it was agreed that test certificates issued by E.D.A. or an Area Board would be accepted.

A special sub-committee agreed that a saving in demand might be made by the ripple control of domestic water heaters, but the opinion was expressed that the design of the installation should be investigated by the Water Heating Sub-Committee to ascertain whether improved load characteristics could not be obtained by other means.

The provision of a more extensive and effective refrigerator maintenance service by Area Boards' personnel was considered by the Refrigeration Sub-Committee, and the production of a comprehensive handbook for maintenance men was put in hand. The sub-committee is continuing to study possible future developments such as quick freezing and locker systems.

Power Station Design

SCHEDULE FOR GUIDANCE OF ARCHITECTS

IN our summary of the last annual report of the Royal Fine Art Commission (*Electrical Review*, 4th March, p. 367) we referred to a directive on power station design which had been drawn up by the Commission for approval by the British Electricity Authority.

This document, now referred to as a schedule, will in future be issued by the B.E.A. for the guidance of architects employed on the design of new power stations who will, in due course, be responsible for explaining their proposals to the Commission.

The Commission considers that designs should be based on clear functional expression, both in respect of the uses for which the various elements in the structure are intended and in respect of the form of construction. It says: "The temptation to give the larger elements of a power station a heavy monumental character more suited to places of public assembly should be avoided. At the same time the architectural quality should be developed from the careful articulation of the several parts of the building, from their relationships to each other within an overall scheme of proportion, and from good detailing and finishes rather than from forced symmetry or the addition of superfluous features."

Designs submitted to the Commission should show all the major elements of the project, including cooling towers, coal handling plant, etc. Efforts should be made to avoid these servicing requirements forming excrescences on an otherwise carefully designed group of buildings.

Drawings submitted should show the relation of the project to its surroundings both as regards layout and relative heights and as regards colour and texture of finishes. The treatment of the immediate surroundings should be carefully considered to minimize the unsightliness of fuel or ash dumps, where appropriate by tree planting. Each design submitted is judged by the Commission on its merits and in relation to its proposed site.

Boiler Water Treatment

Analytical Supervision Justified

METHODS of controlling the purity of feed water for sixteen boilers in the power house at the Billingham plant of Imperial Chemical Industries, Ltd., are described in some detail in a paper submitted by MR. G. NONHEBEL to the London Section of the Institute of Fuel.

Most of the steam goes through pass-out turbines and engines within the factory, while part of the low pressure steam is used for chemical reactions and must therefore be free from impurities. Some 25 per cent of the make-up is softened town water and 40 per cent is condensed processing steam liable to contamination by acid-forming chemicals, or scale-forming sea water from the River Tees estuary, whence cooling water is drawn for condensers.

The final boiler feed is conditioned with caustic soda, sodium phosphate, sodium sulphite and tannin to maintain its composition within defined limits. Elaborate precautions are taken against contamination and the paper contains complete operating data, including analyses of waters and boiler deposits and details of the internal condition of boilers when opened for inspection after 16 to 18 months' continuous steaming.

Railway Signalling

Advantages of Local A.C./D.C. Conversion

By H. C. TOWERS*
M.I.E.E., M.I.R.S.E., M.Inst.T.

FOR small power circuits the metal (copper-oxide) rectifier was a great advance over previous types. It has no moving parts, takes up little space and entails no maintenance costs. The units are assembled on steel bolts (Fig. 1) so that the number of discs in series and parallel can be arranged to suit the voltage and current. The efficiency of the copper-oxide rectifier (expressed as a ratio of mean d.c. volt-amperes to the r.m.s. a.c. volt-amperes), which is maintained over a wide temperature range, is over 60 per cent compared with 3.6 to 43 per cent in the case of other types. The resistance from copper to the oxide coating on one side of it is very high as compared with that from oxide coating to copper, the resistance ratio or rectifying rate being 1,000. Thus, if a unit passes 1 A when 2 V is applied from oxide to copper, only 0.0001 A flows when the same voltage is applied from copper to oxide.

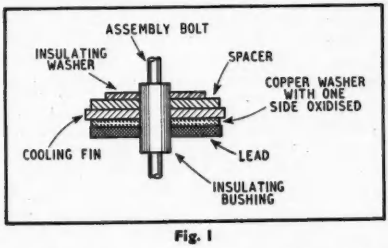


Fig. 1

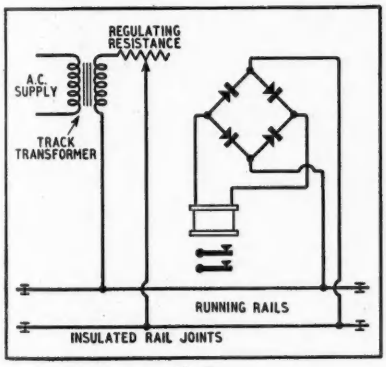


Fig. 2

In an important railway yard the possibility of a power failure interfering with the signalling and interlocking circuits must be reduced to the very minimum. By using a trickle-charged battery, standby can be provided to the a.c. supply to important circuits such as those of point machines.

Direct electromagnetic apparatus is much more efficient than alternating and permits the use of polarizing devices with permanent magnets, which with single-phase a.c. would require phase splitting. An outstanding example of d.c. operation from a.c. mains is in track circuiting. One of several ways of doing this is to supply a.c. to the feed end of the track and convert it to d.c. at the relay end (Fig. 2) where the rectifier is located. As track relays work on a small current, the rectifier may operate inefficiently though it has to handle only the relay current. By putting the rectifier at the feed end and feeding d.c. to the track, the transmission of rectifier losses along the rails is avoided, but the rectifier has to be capable of handling the power loss due to rails and ballast.

Neither system is really suitable for track circuits for electric traction, though the apparatus can be isolated by a trans-

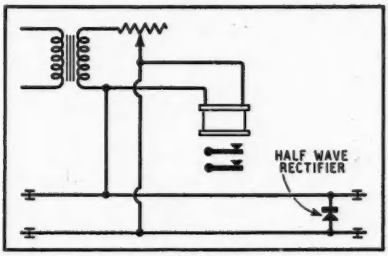


Fig. 3

*Deputy Chief Engineer (Signals), Bombay, Baroda and Central India Railway.

former and condenser. Placing a d.c. relay at the feed end of the track with a half-wave rectifier at the furthermost end (Fig. 3) has been found most satisfactory and provides a higher train shunt.

Another advantage of d.c. over a.c. for operating certain signal devices is exemplified by point machines. The torque of a d.c. motor is greater than that of a similar a.c. motor, so that d.c. from a trickle-charged battery provides quicker operation of points in a busy yard.

Many devices in railway signalling are operated by electromagnets, sometimes of appreciable size. The electrically operated disc or target signal, which is pulled by a large solenoid energized by d.c., is a good example. The rectifier is placed in the base of the signal and the control circuit is a.c. at 110 V.

The d.c. mechanism for a searchlight

Fig. 4

signal is also superior in every way to a.c. This type of signal has only one lens and the colour of the aspect to be displayed is obtained from a miniature spectacle inside the lamp case, operated by a permanent-magnet device and a single winding and bearing red, yellow and green glasses. Good damping is provided and rebound prevented when the spectacle returns to the de-energized (central red) position. Greater clearances can be allowed between the fixed and moving parts with d.c. working. If searchlight signals are to be used on an a.c. system, d.c. mechanisms supplied from rectifiers are preferable.

Other uses for rectifiers in connection with d.c. relays (Fig. 4 and 5) include a d.c. relay operating from an a.c. supply with a half-wave rectifier connected across its terminals; also a rectifier connected across a d.c. relay converts it into a slow-release relay, a principle often employed

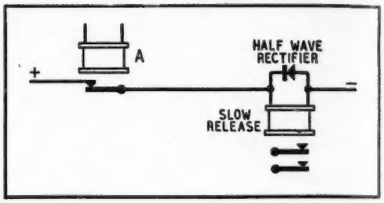


Fig. 5

in signalling circuits to hold one circuit during the operations of other relays. When relay A is de-energized the feed to the slow-release relay is cut off, but the current flowing in the relay coils is inclined to maintain itself. This tendency is assisted by the half-wave rectifier connected across its terminals, thus providing a closed circuit which delays the collapse of the magnetic flux.

For colour-light signal indication circuits (Fig. 6) the rectifier is placed in series with the control lines (red, yellow, or green) and a small d.c. relay is energized across the rectifier. So long as the bulb in the signal is burning, the indication relay is energized, but should the filament burn out the relay would drop. The signal aspects are repeated by miniature colour lights behind the signal lever which are fed by a local circuit controlled by the d.c. indication relay. The back-lock circuit of the signal lever is also taken over this relay so that, in addition to the necessary track circuits being clear, the red indication in the colour-light signal must show correctly before it becomes possible to replace the lever in the normal position.

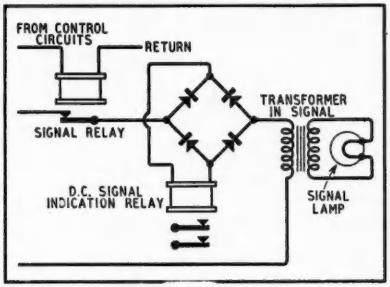


Fig. 6

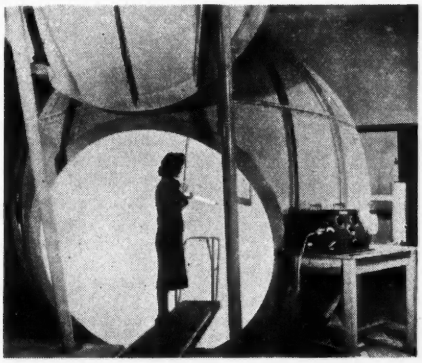
Contact trouble is often caused by excessive sparking or arcing. For d.c. circuits a combination of a resistance and a condenser is only partly effective. If a rectifier is connected across a circuit

which has to be opened (as in Fig. 5) no appreciable sparking appears at the controlling contact. The metal rectifier is also used with a.c. measuring instruments, the inherent disadvantage of which is that they have unsatisfactory scales, are subject to stray fields and are not as accurate as d.c. moving-coil instruments. The latter can be used with a rectifier, thus providing greater accuracy with a better scale and a lower power consumption.

Integrating Photometer

EQUIPMENT AT G.E.C. LABORATORIES

THE development of cold cathode fluorescent lamps in sizes up to 9ft long has led to the need for a spherical integrating photometer of suitable dimensions to measure their luminous output. Such a sphere, 12ft in diameter, has recently been constructed at the Research Laboratories of the General Electric Co., Ltd., Wembley. It is fabricated from rolled aluminium panels in an angle iron segmenfed framework and is recessed in the floor so that the base is about 2ft 6in below floor level. A steel "gangplank," flush with the floor, is mounted on roller bearings so that it may easily be pushed through the opening in the side of the sphere, thus enabling the operator to walk inside and set up the lamp to be measured at comfortable working height.



G.E.C. spherical integrating photometer

The door is suspended on chains and counterbalanced by weights. It is raised and lowered by hoisting gear driven by an electric motor and is both mechanically and electrically interlocked with the gangplank and gate switches. Diffusing windows are fitted at four positions on the "equator" of the sphere, and suitable internal screens are arranged so as to prevent direct light from reaching the window used for measurement purposes. The brightness of the diffusing windows is proportional to the luminous flux of the lamp or fitting under test and can be measured either by visual or photo-electric photometric techniques, the latter being more usual.

The photo-electric measuring apparatus employs an emission type photocell in a d.c. valve bridge amplifier circuit. The photometer unit, comprising photocell, grid leaks and electrometer triode, sealed in an evacuated tubular bulb to ensure freedom from surface leakage troubles, is mounted in a vertical cylinder which is temperature-regulated in order to provide constant accuracy of calibration. The photocell views the diffusing window through a liquid filter matched to the particular photocell used so that the overall spectral sensitivity is close to that of the "average eye." It can therefore be calibrated by reference to tungsten filament standard lamps and subsequently used to measure light sources of widely differing spectral distributions without involving appreciable errors.

Drought in British Columbia

RESTRICTIONS imposed by the B.C. Electric Co. after lack of rainfall left the province critically short of power have now been relaxed so far as industrial consumers are concerned. During the 61-day drought hundreds of workers were on short time and some mills and plants in the Fraser Valley closed. Outside and window display lights are still banned and the use of electric heaters and other appliances by domestic consumers continues to be restricted.

Views on the News

By REFLECTOR

AT the E.D.A. meeting last Friday a friend of mine, in the commercial side of the supply industry, expressed surprise that no mention was made in the luncheon speeches of the electricity surcharge, although the presence of the Minister of Fuel and Power presented a good opportunity of rubbing in the inequity of the impost. He told me that in his own area the ill-effects upon public confidence really alarmed him. Moreover, it was the original declared intention of the Boards not to make money out of the bad business but to secure a balance between the revenue derived from the surcharge and the loss due to the subsequent rebate. It seems to be clear that comparatively few consumers will attain this balance and he thinks that consideration should be given to a larger rebate than 0.1d per kWh.

★ ★ ★

Heavy penalties are imposed upon people in this country who now dare to use electric water heaters. First there is a 100 per cent purchase tax and then there has been the winter surcharge. Small wonder then that British water heater manufacturers have been badly hit. Things are different in the United States, where expansion is proceeding so rapidly that it is estimated that by 1953 there will be 6,000,000 water heaters in use; there were 2,250,000 at the beginning of 1948. If this should come to the eye of the Chancellor of the Exchequer it may help him to decide upon a reduction in purchase tax in his next Budget.

★ ★ ★

It is no uncommon thing to hear complaints of the inadequacy of the provision made in large buildings, particularly factories, for the housing of transformers, main switchgear, etc. Very often it appears that the switchroom is more or less an afterthought and situated in any odd corner not otherwise useful. I have never before, however, come across the state of affairs existing at a new Government factory provided for a well-known domestic appliance manufacturer. The factory is apparently complete but, although the transformers have been installed and there is a small but probably adequate switchroom, there is not the slightest sign of any wiring installation—no conduit, no cables, no suitable sockets or lighting points. The contractors have apparently overlooked them completely.

Actually the company for which the factory is being provided is not unduly perturbed by the delay which must now occur in providing the installation. It is one of those unfortunate concerns whose business has been practically stifled by the 100 per cent purchase tax now applicable to certain appliances.

★ ★ ★

A proposal to form a South East Sub-Centre of the I.E.E. Scottish Centre was postponed four years ago by the after-war circumstances then prevailing. Its revival will, I fancy, be favourably viewed by the Council in London only if strong evidence is forthcoming that the foundation of a Sub-Centre based on Edinburgh and district would better serve the interests of the Institution than continuance of the existing single Glasgow-Edinburgh Centre, with its North East Sub-Centre serving the Dundee-Aberdeen areas. Local members will, I learn, be able to express their views on the subject at a special general meeting to be held in the Heriot-Watt College, Edinburgh, next Wednesday evening.

★ ★ ★

The significance of acidity values is being increasingly appreciated in medicine, chemical processing, food preparation, pulp and paper-making, metal production, water and sewage treatment and steam power generation. The symbol pH is familiar as the index to hydrogen ion concentration, but I have not before come across the term "**Redox**" in this connection. It seems to have been used for a long time in Sweden and Germany as an abbreviation of "reduction by oxidation." It represents the potential which is built up by the exchange of electrons between a bright platinum foil electrode immersed in the solution to be tested and the reducing substances in the fluid, so being a measure of concentration.

Overseas Electrical Trade

SATISFACTORY FEBRUARY FIGURES

ALTHOUGH electrical exports during February fell short of the January total (£9,489,496 against £11,417,452), this was partly accounted for by the shorter working month; exports were well up on the February, 1948, figure (£7,180,558).

This increase as compared with the corresponding month of last year was common to most classes, exceptions being radio equipment, accumulators, instruments (a slight fall) and heating and cooking apparatus. Exports of all classes of cable were much higher, the total for communication cables (including submarine cables) being £680,938 against £575,864, and for power cables £1,346,451 against £965,995. Over half of the communication cables went to South Africa, Australia and New Zealand. Principal customers for rubber-insulated cables were India and South Africa. These countries were also the largest buyers of other types (India £241,866, South Africa £153,577) with Australia (£120,652) third. Iran was the leading foreign importer (£40,483) followed by Sweden (£29,244) and Norway (£25,177).

Domestic radio equipment went largely to Turkey, Egypt, India, South Africa and Malaya. For telegraph and telephone equipment South Africa easily headed the list with purchases valued at £346,675. Next in order came Australia (£174,735) and New Zealand (£115,118). Brazil (£46,746) and Czechoslovakia (£35,784) were the chief foreign buyers. Lighting fittings were taken mainly by India (£68,719), South Africa (£61,378), Eire (£29,485) and Iran (£21,762).

Accumulators to the value of £39,445 were exported to India, while Egypt accounted for £28,619 and South Africa for £25,584. South Africa was also the principal market for heating and cooking appliances (£71,946) and Australia bought to the extent of £52,317. As regards electrical instruments, India was first with purchases valued at £78,826, followed by South Africa (£33,742) and Australia (£28,481).

Table II shows that South Africa was again the largest importer of British electrical goods and apparatus, having increased her purchases by about 45 per cent

TABLE I.—ELECTRICAL EXPORTS

Class	Feb., 1949	Feb., 1948
	£	£
Telegraph and telephone wires and cables (submarine) ...	78,654	77,156
Ditto, not submarine	602,284	498,708
Wires and cables, rubber insulated	432,334	345,096
Ditto, cotton, silk or artificial silk insulated	85,818	50,716
Ditto, enamel, glass or asbestos insulated	74,807	29,716
Ditto, paper insulated	661,645	451,750
Ditto, other	91,847	88,717
Commercial radio apparatus ...	222,439	286,526
Domestic radio apparatus ...	198,144	208,702
Telegraph, telephone and signalling apparatus	1,172,104	697,651
Radio loudspeakers	31,540	12,870
Sound reproducing apparatus components and parts, other than cinematograph apparatus	244,054	197,007
Other radio, etc., apparatus ...	33,296	42,270
Radio valves	152,016	134,402
Electric lighting carbons ...	11,039	6,629
Lamps, not exceeding 24 V ...	32,478	18,547
Discharge lamps...	20,748	20,920
Other lamps	74,941	74,692
Other lighting apparatus ...	388,362	330,220
Primary batteries	84,908	37,664
Accumulators for motor vehicles	136,332	148,549
Ditto, traction	33,059	17,273
Ditto, radio	3,895	2,650
Other portable accumulators ...	28,865	53,210
All other accumulators ...	33,151	49,610
Parts and accessories	75,898	61,989
Cooking appliances	138,998	134,561
Heating appliances	58,158	84,959
Parts and accessories of cooking and heating appliances ...	33,279	26,970
Flat irons	24,625	28,509
Commercial electrical instruments	77,858	95,049
House service meters	144,637	136,071
Time recorders and time switches	13,929	9,201
Other electrical instruments ...	62,986	63,291
Electro-medical apparatus (not X-ray)	35,453	25,402
X-ray apparatus, tubes and parts	74,387	27,711
Permanent magnets	10,366	15,318
Insulating cloth and tape ...	48,279	46,515
Other insulating materials ...	55,058	89,705
Unclassified goods and apparatus	366,591	215,022
Generators up to 200 kW ...	481,199	230,122
Ditto, over 200 kW	306,309	122,955
Ditto, parts	145,980	162,214
Motors, railway and tramway ...	34,156	12,896
Ditto other, up to ½ h.p ...	110,224	45 476
Ditto, from ½ to 1 h.p.	53,123	32,677
Ditto, from 1 to 250 h.p. ...	498,784	272,140
Ditto, over 250 h.p.	98,415	20,294
Ditto, parts	73,294	56,193
Converting machinery	5,286	3,557
Transformers, including coils ...	370,648	398,772
Rectifiers for power house use...	49,937	23,650
Motor starting and control gear	152,392	120,334
Switchgear and switchboards (not telegraph or telephone)...	682,221	519,483
Other electrical machinery ...	20,724	34,141
Vacuum cleaners and parts ...	177,178	137,206
Other electrically operated portable appliances	80,364	46,924
Total	9,489,496	7,180,558

over the February, 1948, figure. India, which was second with £787,765, showed an even greater interest in British electrical goods, the increase in this case being well over 100 per cent. Australia's smaller purchases were more than balanced by New Zealand's increase. The Netherlands headed the list of foreign buyers, closely followed by Sweden, whose share, however, declined very considerably. Portugal's imports also registered a substantial fall, but Norway's increased.

TABLE II.—Distribution of Electrical Goods and Apparatus

Destination	Feb., 1949	Feb., 1948
	£	£
Eire	236,051	243,686
Channel Islands	32,496	33,452
Malta and Gozo	83,727	27,658
Cyprus	28,146	18,888
British West Africa	66,850	67,648
Union of South Africa	1,051,630	723,082
Northern Rhodesia	16,620	5,628
Southern Rhodesia	139,402	53,520
British East Africa	72,031	62,023
Bahrein, Kowit, Qatar and Trucial Oman...	23,223	39,651
India	787,765	344,223
Pakistan	79,220	8,866
Malaya	175,947	142,310
Ceylon	48,320	35,737
Hong Kong	102,648	46,970
Australia	590,618	631,479
New Zealand	369,646	288,197
Canada	77,781	38,248
British West Indies	72,574	31,339
Anglo-Egyptian Sudan ...	12,182	18,485
Other British Countries ...	68,866	65,622
Soviet Union	53,822	27,529
Finland	27,543	25,146
Sweden	151,018	272,063
Norway	98,991	63,494
Iceland	7,365	11,686
Denmark...	95,954	62,719
Poland	36,569	12,581
Germany	5,503	9,484
Netherlands	151,816	136,858
Belgium	71,477	59,933
France	46,068	55,549
Switzerland	23,492	28,439
Portugal	74,484	176,766
Spain	25,066	41,852
Austria	16,695	14,220
Hungary	6,412	3,482
Czechoslovakia	43,641	43,641
Yugoslavia	5,142	5,142
Greece	56,920	19,846
Turkey	74,427	69,654
Dutch East Indies	37,379	9,255
Dutch West India Islands ...	10,996	14,334
Portuguese East India	6,391	10,341
Syria	20,987	9,257
Lebanon	33,636	8,780
Palestine	25,289	34,094
Egypt	158,802	59,367
Iraq	57,172	106,852
Iran	115,522	79,867
Burma	28,548	42,436
China	1,324	67,921
United States of America ...	21,898	13,691
Mexico	31,599	4,449
Colombia...	7,129	11,310
Venezuela	38,272	48,666
Chile	2,021	71
Brazil	76,415	64,721
Uruguay	15,272	31,760
Argentine Republic	143,083	140,761
Other Foreign Countries ...	109,379	104,556
Total	6,149,262	4,941,524

Electrical machinery exports advanced in value from £2,054,904 in February, 1948, to £3,082,692 last month, largely on account of much heavier shipments of generators and motors. It is noteworthy that exports of generators to Russia went up to £203,737, against £90,673 in the corresponding month of last year. India's share also increased substantially—from £111,776 to £201,336. Other large buyers of generators were South Africa (£73,487), British East Africa (£72,379) and Egypt (£43,523). Exports of motors roughly doubled those of February, 1948, thanks to bigger purchases by India (£177,666 against £88,771), South Africa (£134,881 against £80,830) and Australia (£128,324 against £33,185).

While there was a small increase in the value of exports of other machinery and switchgear, there were significant falls in shipments to Russia (from £130,501 to £48,851) and New Zealand (£107,736 to £45,433).

Apart from the purely electrical classes there is a substantial amount of electrical equipment (or plant of electrical interest) which should be mentioned. They are as follows:—Electrically driven or power-driven fans, £132,763; mechanical handling equipment, £147,519; mining machinery, £304,639; steam turbines, £148,069; water turbines, £60,910; power pumps, £265,259; refrigerating machinery, £527,047 (against £182,182); water tube boilers, £389,597; cranes, bridge transporters, lifts, escalators, etc., £634,579.

Imports of electrical goods and apparatus during February totalled £240,429, as compared with £166,714 in the corresponding month of last year. About a third came from the United States, other suppliers being Canada, the Netherlands and Switzerland. X-ray apparatus, furnace carbons, instruments and lighting equipment were the principal items. Electrical machinery imports, largely motors, were valued at £47,715.

Italian Railway Electrification

THE Italian Government has begun work on a four-year plan for electrifying Sicily's main railways. The plan, part of the European Recovery Programme, provides for the electrification by June, 1953, of 569 km of railway—over one quarter of the total in the island. Four lines are involved, namely, Messina-Palermo (232 km); Messina-Syracuse (184 km); Palermo-Trapani (126 km); Fiumetorto-Rocca Palumba (27 km).

The Government is also planning to electrify further sections of railway on the mainland. First to be converted from steam to electricity with E.R.P. aid will be the lines from Bologna to Venice (160 km); Verona to Padua (82 km); Foggia to Bari (123 km).

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT the first meeting of the new Council of the British Electrical Development Association, which followed the annual meeting reported in this issue, **Mr. R. A. S. Thwaites,** acting chairman of the

Mr. R. A. S. Thwaites

Mr. E. R. Wilkinson

North Western Electricity Board, was elected chairman of the Council and **Mr. E. R. Wilkinson,** commercial manager of the British Electricity Authority, vice-chairman.

Mr. T. S. Wallis, station superintendent, Feeder Road generating station, Bristol, of the B.E.A. South Western Division and formerly Bristol Corporation Electricity Department, retired on 23rd March after twenty-three years' service. Mr. Wallis was previously with Manchester and Wimbledon Corporations. He is succeeded by **Mr. W. Sinclair,** A.M.I.E.E., A.M.I.Mech.E., who has been his assistant for some years.

Mr. R. P. Middleton has been appointed manager of Barr's (Sheffield), Ltd., electrical engineers and contractors, and is on the board of directors, this company being in association with Electric House (Denton), Ltd. **Mr. P. J. Houlton** has also recently joined the company as supervising electrical engineer.

Mr. H. G. S. Peck, B.Sc. (Eng), M.I.E.E., has just retired from the post of staff engineer, Organization and Efficiency Branch, Engineer-in-Chief's office, G.P.O. Mr. Peck served with the National Telephone Co. from 1900 to 1913, after which he became associated with the Post Office Engineering Department. During his long association with telephone and telegraph development in this country Mr. Peck has taken active part in the conversion of the London telephone system from magnetos to common battery working, the design and installation of large private branch exchanges, and the wiring of buildings, and the conversion of the London and Birmingham systems from manual to automatic operation. He has organized visits of teams to Germany to investigate German telephone and telegraph practice. Mr. Peck was in the R.F.C. and the R.A.F. in the 1914-18 war, and during the last war was a member of the Inter-Service Components Committee, a member of the Radio Production Executive, and chairman of the Precedence Panel for Line Telecommunication Equipment (Working Committee) which controlled the production of equipment for the Services and civil uses at home and overseas. He was a member of the I.E.E. Committee which produced the "Post-War Building Study. No. 11—Electrical Installations," and is chairman of the I.E.E. Committee for Codes of Practice on Telecommunications in Buildings.

Mr. T. H. Heritage is retiring at the end of this month from the post of Hawick district manager of S.E. Scotland Electricity Board. Mr. Heritage went to Hawick in 1922 as chief assistant engineer of the Urban Electric Supply Co. and became manager in 1926.

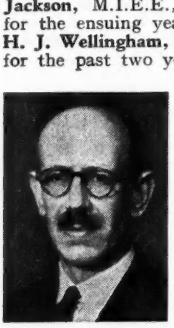
Mr. H. W. Ashton, A.M.I.E.E., recently retired after fifty years' service in the electricity supply industry. For thirty-three years he was resident engineer and manager for the South Cumberland Electricity Supply Co., Ltd., and for the past year as executive officer for the South Cumberland unit merged into the North Western Electricity Board. Mr. Ashton's early experience was gained with T. Harding Churton & Co., electrical engineers, Leeds, following which he was for thirteen years with the Harrogate Corporation Electricity Department. At a farewell gathering of the staff Mr. H. Bland, consumers' engineer, Whitehaven District, Lakeland Sub-Area, presented Mr. Ashton with a portable wireless set.

Mr. H. W. Ashton

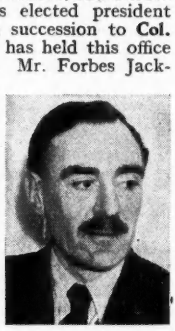
The Royal Society has elected **Dr. R. W. Bailey** and **Sir Ben Lockspeiser,** M.A., M.I.Mech.E., as Fellows of the Society. Mr. Bailey is head of the Mechanical and Metallurgical Research Department of the Metropolitan Vickers Electrical Co., Ltd., Manchester, and is distinguished for his contributions on the behaviour of metals at high temperatures and for advances in design of turbines. Sir Ben Lockspeiser, Chief Scientist with the Ministry of Supply, is succeed-

ing Sir Edward Appleton as secretary of the Department of Scientific and Industrial Research on 1st May. He is well-known for his contributions to the development of modern aircraft.

At the annual general meeting of the Batti-Wallahs' Society on 14th March, **Mr. Forbes Jackson,** M.I.E.E., was elected president for the ensuing year in succession to **Col. H. J. Wellingham,** who has held this office for the past two years. Mr. Forbes Jack-



Mr. Forbes Jackson



Mr. A. H. Hughes

son has been divisional engineer (electrical) to the London County Council since 1933, and is a past chairman of the I.E.E. Installations Section. **Mr. J. W. Woolley,** who has been acting secretary and treasurer since the death of Mr. M. Whitgift, is unable to continue owing to pressure of business, and **Mr. A. H. Hughes,** sales engineer with British Insulated Callender's Cables, Ltd., has been elected hon. secretary and treasurer of the Society. Mr. Hughes is hon. secretary of the Electrical Industries' Golf Championship, which last year raised £450 for the E.I.B.A. **Mr. J. Temple Hazell** continues as hon. assistant secretary and treasurer, and the members of the Committee are Messrs. A. G. Freeborn, J. W. Perkins, J. W. Porter, H. J. Stone, A. Williams and J. Nelson, with Mr. Woolley as a co-opted member.

Mr. A. E. Newland has been appointed home sales manager of the Gramophone Co., Ltd. **Mr. G. D. Putler** continues as export sales manager.

Speaking at the annual dinner-dance of the **Electrical Contractors' Association (Bradford Branch),** Col. W. M. Lapper, chairman of the Yorkshire Electricity Board, said that with the advent of the new large power stations and with the increasing supply of materials there would be plenty of business available in the next ten years. Other speakers included Mr. H. Dennell, Mr. A. S. Redvers Pratt and Mr. J. Collins. During the evening a presentation was made to Mr. Armistead Smith, retiring hon. secretary, after twenty years in office.

The Council of the Institution of Civil Engineers has awarded the James Alfred Ewing Medal for 1948 to **Sir Edward V. Appleton,** G.B.E., K.C.B., F.R.S.

A group meeting in London of representatives of the Factory Joint Committees from each of the factories in the **A.B.O.E.-Brush** group was held for the first time on 18th March at the Charing Cross Hotel. The meeting, which was attended by fifty representatives and was presided over by Mr. A. P. Good, was preceded by a luncheon at which the general managers of each company in the group were also present. In the evening Mr. Good gave a dinner to 120 members of his senior executive staff at the Dorchester Hotel. Sir Ronald Matthews, chairman of the Brush Electrical Engineering Co., Ltd., proposed a toast to the future prosperity of the group to which Mr. Good responded.

Obituary

Mr. Arthur Joseph Richardson, who was senior executive officer in the Hawarden district of the Merseyside and North Wales Electricity Board until his retirement in December last, died a few days ago at the age of sixty-five years. He was electrical engineer to Hawarden R.D.C. for twenty-three years up to the time the undertaking was taken over by B.E.A.

Mr. N. F. Lowry.—The death occurred on 17th March, at the age of thirty-five of Mr. Norman F. Lowry. Mr. Lowry joined the Bromley electricity undertaking in 1935 as a junior engineer. He became consumers' engineer in 1938, and held that position until vesting date, from which time until his death he served in a comparable capacity with the London Electricity Board. Throughout the recent war he served with the R.A.F. He leaves a widow and one son.

Sir Archibald Page.—A memorial service for Sir Archibald Page was held at St. Saviour's, Walton Street, on 21st March. Among those present were: Mr. J. Page (son), Captain and Mrs. D. Simpson (son-in-law and daughter), Miss K. Page (daughter); Sir John Hacking (British Electricity Authority) with other officials and members of the staff; Sir Cyril Hurcomb (chairman, British Transport Commission), Sir Harry Railing (G.E.C.), the Dowager Lady Swaythling and Dame Caroline Haslett (E.A.W.), Sir John Dalton, Lady (Andrew) Duncan, Sir Duncan Watson, Sir Montague Hughman, Sir Ralph Wedgwood, Sir Frank Gill, Sir Thomas and Lady Purves, Mr. T. G. N. Haldane (president, Institution of Electrical Engineers), with Mr. B. H. Leeson (vice-president), Mr. R. Kelf-Cohen (Ministry of Fuel and

Power), Mr. I. R. Cox, Mr. D. MacArthur, and Mr. J. I. Law-Brooks (Metropolitan-Vickers Electrical Co.), and Mr. H. Nimmo (chairman, Southern Electricity Board).

Wills

Mr. J. T. Browne, a director of British Electrical Repairs, Ltd., British Engine Boiler & Electrical Insurance Co., Ltd., and other companies, who died on 23rd August last, left £26,210 gross, £25,022 net.

Col. S. M. Tate, O.B.E., assistant managing director of Tube Investments, Ltd., who died on 23rd December, left £21,767 gross (£19,285 net).

Mr. W. S. Knowles, sub-area manager of the Yorkshire Electricity Board, who died on 13th February last, intestate, left £1,899 gross (£1,712 net).

Mr. H. J. Fuller, founder of H. J. Fuller & Sons, Ltd., manufacturing electrical engineers, who died on 9th December last, left £1,737 gross (£1,696 net).

Mr. E. S. M. Prichard, A.M.I.E.E., late manager and director of the New Switchgear Construction Co., Ltd., who died on 27th November, left £80,292 gross (£75,770 net).

Mr. W. O. J. Urry, a director of Heenan & Froude, Ltd., who died on 10th November last, left £12,324 gross (£12,113 net).

Capt. T. J. Holman, M.N., retd., formerly chairman of Topsham Electricity Supply Co., who died on 21st November, left £1,912 gross (£1,842 net).

NEW BOOKS

The Theory and Use of the Complex Variable. By S. L. Green. (Second edition.) Pp. 136; figs. 47; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 12s 6d.

Most electrical students are familiar with the algebra of the complex quantities used in a.c. theory. This book is an introduction to a higher branch of mathematics in which complex quantities are treated as variables. The opening chapters discuss complex numbers with reference to logarithmic exponential and hyperbolic functions. After explaining the meaning of functions of a complex variable, the author deals with conformal transformation and with applications to problems in physics and electrical engineering. The concluding chapter on the elements of a.c. theory is quite elementary in character and seems out of place in a book of this kind.

Mr. Green has dealt very ably with a difficult subject and his book will be useful to students intending to offer mathematics in a final examination for an engineering degree. It is well illustrated and contains a number of problems with which the reader can test his knowledge. The style is, however, condensed and academic in character, the book being essentially one for those having a real taste and some talent for mathematics.—G. W. S.

Physical Aspects of Colour. By Dr. P. J. Bouma. Pp. 312; figs. 113; index. Cleaver Hume Press, Ltd., 42a. South Audley Street, London, W.1. Price 30s.

The science of colorimetry suffered a severe loss by the death in 1947 of Dr. P. J. Bouma, who had made important contributions both to the theory of the subject and to its application in practical problems of illumination. It is fortunate that he lived to complete the writing of the present book, which gives an excellent treatment of the scientific bases of the subject, a treatment at the same time fuller and more balanced than any other so far published.

The style is clear and the mathematical demands made on the reader are very moderate. The translation and the standard of production of the book are both admirable and there are numerous tables of use to the colorimetrist, as well as an extensive bibliography. Without doubt, this is a most important contribution to the literature of colour and will be an invaluable aid to everyone interested in the subject. It is a worthy memorial to its author, and a word of appreciation is due also to his colleague, Dr. De Groot, who did much to assist the publication in Dutch and the production of the English edition.—J. W T. W.

Books Received

General Physics. By F. Oldham and E. Langton. Pp. 594; figs 449; index. London University Press, Ltd., 10, Warwick Square, London, E.C.4. Price 8s 6d.

An Introduction to Planning. By G. Bell Barker. Pp. 84; illus. and index. Percival Marshall & Co., Ltd., 23, Great Queen Street, London, W.C.2. Price 3s 6d.

Metal Working and Heat Treatment. Vol. III. By F. Johnson, D.Sc. Pp. 185; figs. 82; index. Paul Elek Publishers, Ltd., 38, Hatton Garden, London, E.C.1. Price 21s.

Electricity in the Small Workshop. By J. Bradley and N. Hallows. Pp. 60; figs. 32; index. Percival Marshall & Co., Ltd., 23, Great Queen Street, London, W.C.2. Price 3s.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

"Surcharge—Rebate"

IN your 18th March issue Mr. J. Ashmore takes up the cudgels on behalf of the "all-electric" consumers, but admits that during the surcharge quarter he consumed more than twice what the average consumer uses in a whole year.

It seems to be in the nature of a restrictive measure that it may cause hardship to some—or even very many—people, and there are numerous much more serious restrictions which have had to be endured as an aftermath of the war. Fortunately — or, unfortunately — truly all-electric consumers still represent a very, very small minority, though comprising many of the more progressive (and articulate) members of the industry.

To the question: "How can anyone go easy on electric fires during the surcharge in an all-electric house?" there are several answers, but the most pertinent is perhaps: "Use your coal fire, if you still have one." This country was in serious danger of economic setbacks due to power cuts during the past winter and, unfortunately, the situation will not improve for some time, thus demanding further sacrifices. That the goal should be removal of all restrictions on usage and development, everybody seems agreed. ELECTRICUS.

Engineers, Experience and Frustration

FROM time to time the presidents of Institutions approach the subject of the engineer in modern society and its associated problems, and occasionally some stress is laid on the requirements for the training of engineers. There is, however, little change in the attitude of the administration and society towards engineers. This is mainly due to the following causes, which appear to be deeply rooted in our industrial mentality.

In the past, and even the present, professional engineers have seldom held administrative positions. The engineering profession is not regarded by society as being on a par with the other liberal professions, but more in the nature of a "trade," the term "sanitary engineer" being a striking example of the misnomers frequently encountered. Lastly, the great majority of engineers have only a lukewarm interest in their profession, and have, in many cases, not entered the profession from free choice.

The result is that, to-day, the engineering employers are reluctant to admit, even suspicious of, the abilities of potential employees and regard past experience as their only guide. While recognizing that personal experience is of great value, it should not take such a preponderant place nor be allowed to be the sole criterion of acceptance or rejection of a candidate.

It must be realized sooner or later that, in view of the present difficulties which face the world, it is impossible to "have the cake and eat it as well." If employers wish to obtain the services of university-trained men and keep on attracting young men into the industry, they must take legitimate risks and refrain from judging individuals solely on past experience.

If we are to accept the Truman declaration on the exploitation of natural resources in under-developed areas, we must also accept the engineering profession in its broadest and truest sense, namely, "the harnessing of natural resources for the benefit of mankind." The study of such schemes requires young men of adaptable character, wide interests and willingness to tackle original problems and apply fundamentals.

The electrical industry is already filled with "experts" having years of experience in particularly restricted fields; surely we do not need more specialization! On the occasion of the centenary of the Institution of Mechanical Engineers in 1947, a paper on "Education for Engineers" was read by Dr. Doherty, president of the Carnegie Institute of Technology, in which it was pointed out that specialization in the U.S.A., in the inter-war period, was carried much too far and that it was at present realized that what was needed was university courses aiming at broader bases and a sounder knowledge of fundamentals.

Engineering is not an isolated profession; it is a vital part of our civilization, and it is an essential element in world progress. In its wide field of application,

engineering is closely related to economics, geology and sociology.

If we are, therefore, to attract into the industry men with a wide educational background, broad interests, administrative ability and sound scientific knowledge of fundamentals, it is time we discarded some of our prejudices and relaxed our stringent requirements respecting "past experience."

Twenty years' experience is often one year's experience twenty times over.

A. P. V.

Earth Leakage Trips

MOST earth leakage trips are constructed suitable for sealing and I have, in fact, seen a great many installed between the main fuses and the meter. If the meter has a metal case, this seems to be the only safe procedure.

A disadvantage of this scheme, however, is that in the event of the trip opening, the whole house will be left in darkness until the circuit on which the earth fault has occurred (probably not a lighting one) can be isolated.

UBIQUE.

Fair Trading

THE letter from "Nemo" in your issue of 18th March asks "Is it really fair trading that the B.E.A. is to be given greater discounts than contractors?"

The implication that the B.E.A. is to be accorded a status or preferential discount is not factual as far as the Electrical Fair Trading Council is concerned. The correct position is that the Fair Trading Council, which includes manufacturers, wholesalers, contractors and retailers, regards the B.E.A. as a section of the industry and therefore entitled to trade terms whatever these may be for the various products. Further, in order to give effect to the general desire for fair trading in the industry, the Fair Trading Council has issued a recommendation to all concerned that, quantity for quantity, the terms granted to the B.E.A. shall also be available to electrical contractors and retailers.

"Nemo's" statement that the manufacturing side of private enterprise is not showing much sign of supporting the contracting side is, therefore, quite untrue of those manufacturers represented on the Fair Trading Council.

Fortunately Lord Citrine has made it clear on many occasions that the policy of the B.E.A. is to compete on *fair terms* with contractors and retailers and therefore while the B.E.A. will no doubt wish to purchase at the lowest possible price, it follows that the same terms should be available to contractors and retailers.

ARTHUR S. LOWE,
Secretary,
Electrical Fair Trading Council.
London, W.C.2.

WHILE I am hesitant to reply to anonymous writers, I think that "Nemo" has "got something." In view of the fact that some supply authorities were the instigators of shoddy installation work, it will be difficult to visualize in the future what type of installations will be connected to the mains.

The Electricity Boards have evidently decided to embark on installation work in a big way and it is rather surprising that they have not included joinery, plumbing, painting, etc., in their programme. In my view, the B.E.A. and Boards have quite enough "on their plate" to supply electricity at economic rates. If bona-fide electrical contractors do not "get to grips" with these intruders, they may well find themselves out of business.

Perhaps some of the members of the B.E.A. can answer "Nemo's" question: "Who will decide whether or not an installation carried out by the B.E.A. will be safe for connecting to the B.E.A.'s mains?" ALEX. MILNE, Senr.

Glasgow.

Manufacturers' Price Lists

IN his letter in your issue of 18th March Mr. A. E. Norris apparently refers to the issue of sectionalized catalogues, when he states that "after a period of time . . . . the price lists would be subject to a different percentage adjustment in respect of each list issued and this would be most confusing."

Where this applies, assuming a manufacturer has issued a complete set of lists since the war, there appears to be no reason why his prices should not be based on 1945 or later so that increases or decreases would be in the region of 5 to 15 per cent instead of the ridiculous 100 to 130 per cent we are having to contend

with as a result of employing a 1939 basis. Where a complete catalogue is issued I see no reason why each issue should not be up-to-date.

The reasons given by Mr. Norris do not apply to all manufacturers since many sectionalized catalogues based on 1939 prices have differing increases.

That the percentage adjustment is not a necessary evil is borne out by the issue of lists carrying current prices by one or two manufacturers who have a selling outlook, and make it easy for their customers to purchase their products.

Harrow. E. H. MALTBY.

N.Z. Railway Electrification

THE New Zealand Minister of Railways (the Hon. R. Semple) announced last week that four officials of the Railways Department would shortly be leaving to study the technical aspects of electrification problems abroad. They are Messrs. P. R. Angus (chief mechanical engineer), A. J. Ede (transportation superintendent), C. A. Mackersey (electrical engineer) and J. W. Porter (signal engineer).

Mr. Semple said that two representatives of a British construction firm had already done much research into the problems of electrifying the main trunk railway between Wellington and Auckland, and technical calculations were now being made in England and New Zealand irrespective of whether an a.c. or d.c. scheme was adopted. A contract might be signed with this company to provide most of the technical and labour force needed.

Big electrification schemes were being considered in spite of the fact that power was now rationed because railways used relatively little power. The electrification of the main trunk line from Auckland to Paekakariki would use no more than the power from one of the three generators at Karapiro. This would save 200,000 tons of coal a year, which was now being imported from overseas at high cost.

Belgian Electrical Trade

IN 1948 Belgium's imports of electrical machinery and apparatus again exceeded her exports of these goods, the respective totals being fr. 7,122,007,000 (compared with fr. 2,032,390,000 in 1947), and fr. 5,503,208,000 (fr. 1,680,893,000). Leading items amongst imports, with values in thousands of Belgian francs were: Dynamos, motors and rotary convertors weighing over 10 kg, 163,850; domestic appliances and small tools, 120,000; lamps, filament, 52,930; radio valves, 79,453; radio receivers, 156,467; measuring and registering instruments, 35,978; meters, 33,082; enamelled wire, 43,713; switches, sockets, fuses, etc., 114,114; and automatic switchgear, etc., 41,787. The principal suppliers of these goods were Holland, Great Britain, Switzerland and the United States.

Belgian electrical exports were directed chiefly to France, Holland, Sweden, the Belgian Congo and Argentina. Outstanding items were: Generators, motors and convertors weighing over 10 kg, 419,378; transformers over 10 kg, 175,995; Lamps, metal filament, 72,713; radio valves, 65,657; radio receivers, 181,500; telephone apparatus, 415,622; metal armoured and rubber insulated cable, 123,445; metal armoured and paper or textile insulated cable, 56,322; unspecified cable, 110,299; other cable insulated with rubber or similar material, 104,703; and small installation material, 68,318.

Finchley Retrospect

FORTY-FIVE years of municipal control of electricity supply at Finchley is reviewed in an illustrated booklet published by the Borough Council. During that period the undertaking came under the management of three engineers: the late Mr. E. Calvert was in charge of it until his retirement in 1936, and he was followed by Mr. C. R. Westlake and (in 1948) Mr. C. Bradley.

In 1923 the generating station gained first place among 53 comparable stations for thermal efficiency, coupled with lowest fuel consumption per kWh generated. The undertaking also had the distinction of being the first in the country to supply, at Mr. Westlake's suggestion, cookers under the domestic two-part tariff without further charge. The issue of cookers under this scheme commenced in April, 1937, and three months later the installation of the 10ooth cooker was celebrated. Finchley again "came into the news" with its goldfish. The cooling lake had become an extensive breeding place for mosquitoes and to combat this nuisance it was decided to stock the lake with larvæ-eating fish, which proved profitable as well as effective. The original stock cost £35, and subsequent sale of fish to breeders produced a revenue of nearly £600.

Relaxation of Controls

MR. H. WILSON, President of the Board of Trade, announced on Tuesday last the removal of quantitative restrictions from twenty-nine commodities and the relaxation of controls on a further twenty-four items. Among the goods under the former heading are electrical fittings made from rennet casein.

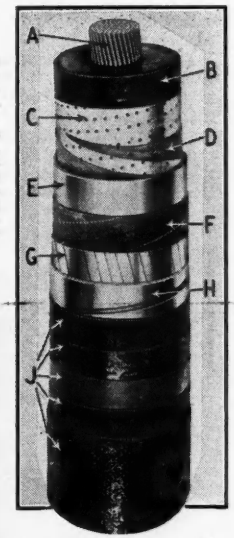
220 kV Pressure Cable

MADE IN ENGLAND FOR INSTALLATION IN FRANCE

AN underground power cable designed for continuous 200 MVA duty in service at 220 kV has been manufactured by British Insulated Callender's Cables, Ltd., and is being installed in France in conjunction with the French cable firm, Trefileries et Laminoirs du Havre. It will be laid in the grounds of the Clamart Laboratories of Electricité de France and be connected to the 220 kV grid network for long-term field testing in view of the intended use of this type of cable on the 220 kV network in France.

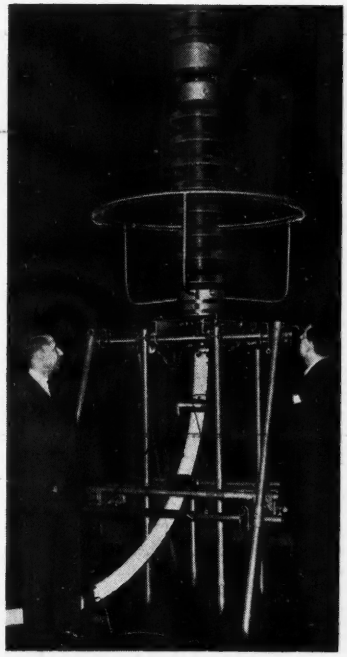
The 110 yard (100 metre) 3-phase loop of single core cable with sealing ends, joints and gas control equipment will be subjected to very severe tests before and after installation.

The cable is of the impregnated pressure type with a conductor consisting of 91/.014in (91/2.64 mm) tinned copper wires stranded in circular form, the strand having a cross-section of 0.775 sq in (500 sq mm).

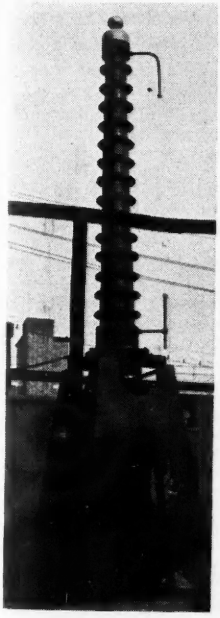


Sample of cable

A=stranded tinned copper conductor, B=impregnated paper dielectric, C=perforated metallized paper screen, D=copper woven fabric binder, E=lead sheath, F=copper woven fabric bedding, G=longitudinal copper tape reinforcement, H=circumferential copper tape reinforcement, J=bitumen rubber sandwich serving



Prof. M. Laborde (Electricité de France) and M. J. Desbordes (Tréfileries et Laminoirs du Havre) viewing cable at Wood Lane laboratories



(Left) Porcelain sealing-end with stabilizing glaze

The mass-impregnated paper dielectric, which includes the usual outer screen of metallized paper, involved simultaneous application of more than 200 paper layers during manufacture on the largest cable-making machine of its kind in this country. This machine has 38 lapping heads, each suitable for the application of six cable papers; it is 173ft (52.5 metres) in length.

Copper woven fabric tape is applied over the completed dielectric to protect the metallized paper screen and to ensure positive contact with the lead sheath. As in standard i.p. practice, only one lead sheath has been used, extruded with a small clearance to assist gas charging. It is covered with special cable reinforcement tapes applied in such a manner that adequate strength is given to the lead against both

the longitudinal and circumferential mechanical stresses that are set up when the cable is charged with inert (nitrogen) gas at 200 lb/sq in (14 kg/sq km) pressure. The cable is finally served with a special anti-corrosion protection of alternate layers of rubber and bitumen-impregnated tapes.

The cable was manufactured at the Erith works of B.I.C.C. The overall diameter is 3.774in (9.6 cm) and the weight is 51.3 lb/yard (25.4 kg/metre).

A feature of the design is the adoption of semi-conducting glaze on the sealing-end porcelain to equalize the end-to-end stress, the first time it has been used for 220 kV.

Cast plumbs are used for hermetically sealing the main joint sleeve to the sheath and for anchoring the reinforcement tapes. An outer sleeve of copper for the main pressure housing and an inner sleeve of lead, plumbed at each end to the sheaths, provide a continuous pressure-skin across the joint and a means of pressure-testing the joint before it is finally put into service.

A 15 yard (14 metre) sample length of cable complete with one joint and two sealing ends has been given a special series of high-voltage tests in this country. They were subjected to 350 kV for a total period of over 24 hours.

A series of impulse tests will be applied to the sample consisting of 20 impulses at 1,080 kV peak, 10 consecutive impulses of each polarity. Finally, the surge breakdown voltage of the installation will be ascertained by raising the surge voltage until breakdown or flashover occurs.

In addition a 110 yard (100 metre) three-phase feeder will be installed at Clamart and connected to the 220 kV French grid for long-term test. The installation is required to withstand current overloads up to 80 per cent for periods of time up to half an hour, the overload trial starting from full-load equilibrium conditions.

At a later date full details will be published of the results of the English and French tests.

Viewing Magnetic Fields

A NOVEL electronic device comprising a gaseous diode arranged to produce luminous beams which closely follow the direction of a magnetic field, thereby giving observers the impression of actually seeing magnetic lines of force, was described by S. G. Lutz and S. J. Tetenbaum in *Electrical Engineering*, the journal of the American I.E.E.

That an electronic beam follows a curved magnetic field may seem strange, as it is well known that a moving electron in a magnetic field experiences a force perpendicular to the plane defined by the directions of its motion and of the magnetic field. In the more familiar applications of this phenomenon the major component of electron velocity is perpendicular to the magnetic field and the diameter of the circular or helical orbit relatively large. In this tube, however, the perpendicular components of velocity of the electrons are so low that their orbits are tight helical beams. Surprisingly enough, the axes of these beams bend with the curvature of the magnetic field and follow it quite accurately.

The electrode structure for a simple tube of this kind consists of an oxide-coated cathode and a coaxial anode having perforations or slots. Electrons are accelerated towards the anode and some of them pass through the holes. The tubes contain mercury vapour, so the anode potential is limited approximately to the mercury ionization potential (10 to 15 V) and the electrons emerge from the anode perforations with correspondingly low velocity. The electrons ionize the mercury vapour, and the consequent deionization is visible as a bluish glow. This method of making visible the paths of electrons has been used for studying electron orbits in magnetrons, image tubes and similar devices.

The major velocity component of the electrons emerging from the anode perforations is in the direction of the magnetic field, and this component of velocity does not cause a deflecting force except as it gradually deviates from the curving field. Because the total accelerating potential is only 10 V to 15 V, the velocity components perpendicular to the field are very low, thus explaining the very small diameter of the helical orbits obtained even with moderate magnetic fields.

It must be emphasized that these tubes are intended only to show the directions of magnetic fields and not to measure the field strength. The spacing of the beams is determined by the spacing of the anode beams and not by the "flux lines" per unit area. Some qualitative information concerning field strength is furnished by the convergence or divergence of the bundle of beams and by the sharpness of focus of individual beams. At present the tube seems most useful as a demonstration device. However, it may be used to map fields by successive exposures on a single photographic negative, a print of which may then be used as a guide to reduce the labour of conventional flux plotting procedures.

PARLIAMENTARY NEWS

By Our Special Reporter

THE Iron and Steel Bill is now through the Committee stage in the House of Commons. Owing to the use of the "guillotine" the Standing Committee has been unable to consider large portions of the Bill. On no fewer than eleven clauses and one schedule discussion was curtailed; 23 clauses and six schedules were not discussed at all. There are 58 clauses and eight schedules.

North Wales Development

Mr. Price White asked the Minister of Fuel and Power what measures of development of hydro-electric power in North Wales had been included in the general programme of the Central Authority, settled with him in accordance with subsection (2) of Section 5 of the Electricity Act, 1947.

Mr. Gaitskell said that the answer to the first part of the question was none. He understood that the British Electricity Authority would publish details of its general programme in its annual report.

"Severance" Payments

Mr. Molson asked the Minister of Fuel and Power whether he was now in a position to announce the regulations to be made under Section 23 of the Electricity Act, 1947, for the distribution to local authorities, now incorporated in the North Western Electricity Board, of the global sum of £5,000,000.

Mr. Gaitskell said that this matter was still being discussed by his Department with the associations representing local authorities.

London Transport Developments

Mr. Ernest Davies asked the Minister of Transport why, in settling the programme of reorganization and development of the London Transport Executive in accordance with Section 4 (2) of the Transport Act, 1947, he had agreed to priority being given to the construction of the extension of the Bakerloo Tube and authorized it to be commenced in 1950, when improvements could be brought to a larger section of the population, and at cheaper cost, in more needy areas, such as North London; and whether, in settling the programme for the development of London's transport facilities in accordance with Section 4 (2) of the Transport Act, 1947, he would include as a first priority the electrification of the railways serving the North London area, including Tottenham, Wood Green, Edmonton and Enfield.

Mr. Barnes said that the British Transport Commission had recently submitted to him a report, which would shortly be published, giving its views on the proposals made by the Railway (London Plan) Committee. No programme for the development of transport in London had been submitted for his approval under Section 4 (2) of the Transport Act, which in any case did not require his formal consent to specific projects. He could not anticipate the eventual decision as to the priority of surface electrification in the London area, but the needs of North London would be fully taken into account. The extension of the Bakerloo Line to Camberwell would enable the service on this line as a whole to be improved and was on this account urgently needed. Powers for this extension were obtained in 1931 and some of the preparatory work had been done. The scheme had been approved for inclusion in the investment programme for commencement in 1950, provided that the agreed level of investment permitted.

Employment in Nationalized Industries

Mr. Piratin asked the Chancellor of the Exchequer if he would give an estimate of the proportion of industry.

Sir Stafford Cripps said that on the basis of the total number of employees in industry, transport and communications in Great Britain at the middle of 1948, industries under public ownership at the present time represented about 17 per cent of the total. The inclusion of gas, iron and steel and the balance of road transport would raise the percentage under public ownership to about 21 or 22.

Radar for Canada

Mr. Cobb asked the Minister of Supply what information he had on the possibility of our earning Canadian dollars by supplying part of the equipment for the projected radar interceptor network across Northern Canada. Mr. Strauss replied that inquiries were being made in Canada.

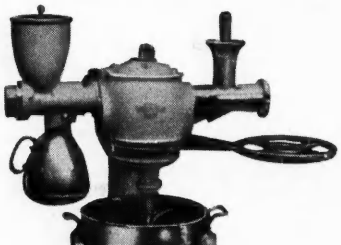
Trolley-Buses in America.—During last year 1,346 trolley coaches were delivered to operators in the United States, according to Mr. E. Kearns, manager of the G.E. Urban Transit Division. There are now 6,500 vehicles of this type in use or on order in this country.

French Domestic Appliances

FROM OUR PARIS CORRESPONDENT

EVERY year the Salon des Arts Ménagers in Paris shows novelties carefully saved by manufacturers for the occasion to the thousands of visitors who flock to see them. Despite fairly high prices, this year's Salon had the added attraction that purchases could be made on the spot and much business was done, particularly in labour-saving household electrical appliances.

A number of manufacturers seem to have specialized in apparatus for preparing vegetables and some of these perform varied functions such as the "Melerex," a universal



"Melerex" combined mixer, mincer and coffee mill

electric mixer which combines a mixing bowl for vegetables, a mincing machine and a coffee grinder. The apparatus is specially designed for large families or small canteens and additional equipment enables it to cut and sieve vegetables as well as producing ice cream. For crushing vegetables, mixing dough, whipping cream, pressing fruit, etc., there was the ⅛ h.p. "Magic Mixer" produced by Electromagic.

Electric washing machines shown included two models by Electrothermie, the first (3 kW) taking 8 kg of linen and the other (2.5 kW) 4 kg of linen. When not in use the machine resembles a cooker. Conord also showed two types of washing machines, one with a ¼ h.p. motor and the other a ½ h.p. motor. The ¼ h.p. Sauter electric washer can wash and dry clothes simultaneously. It has a regulable 500 to 2,500 W heating element and weighs 120 kg. The Basile apparatus is an electric dishwashing machine which washes, rinses and dries dishes in a few minutes. The lid has a glass portion which enables operations to be followed.

Among electric cookers exhibited were several models by Electrothermie. These included mixed gas and electric models as well as heat storage cauldrons. In addition to the usual cooking facilities, the Othermo apparatus supplies hot water. Heat for all normal purposes comes from a storage block, but additional elements are provided for special purposes.

Working on electricity, gas or butane, the Basile refrigerator displayed is entirely automatic and thermostatically controlled. Combined gas and electric cookers were shown by the same firm with four regulable hot plates of 800, 1,200 and 1,800 W. The oven door has a glass window.

Swedish Communication Equipment

AT the International Radio Congresses held in Stockholm some months ago the Swedish Telefonaktiebolaget L.M. Ericsson demonstrated the result of research work which has been carried out with a view to developing radio links. In the system demonstrated, twelve independent conversations can be transmitted simultaneously over the same radio beam. These radio links are particularly suitable for inter-urban telephone systems. The subscriber does not notice any difference, and the calls are put through by the operator in the ordinary way.

Those attending the congresses had an opportunity of seeing two different systems, one operating on a wavelength of 3 cm, corresponding to 10,000 Mc/s, and the other 1,67 m or 180 Mc/s. The transmitting apparatus for the 3 cm system was installed in L. M. Ericsson's experimental tower, which is the highest concrete tower in Europe (236ft 3in). The receiving apparatus was placed on the top of a newly built water tower in Södertälje, a town 14 miles away. The height of the aerials above sea-level is 341 and 334ft respectively.

The equipment operating on the longer wavelength of 1.67 metres works on the frequency modulation principle and has been designed specifically for power companies and similar undertakings which need to get into rapid communication with their various stations or plants. By this system a telephone conversation and up to seven telemetering channels are transmitted simultaneously. In view of the longer wavelength, it is possible to transmit to positions beyond the optical horizon, which is not the case with the 3 cm system.

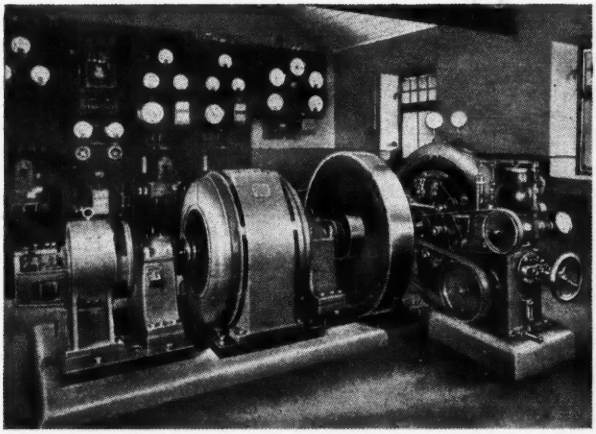
Small Water-Power Station

Operation of the Coniston Plant

By W. T. WARDALE
A.M.I.E.E.

THE Coniston hydro - electric power station, now incorporated in the North-Western Division of the B.E.A., was started by a non-statutory company in 1913 with a 35 b.h.p. Pelton wheel driving by belt one, and later two, 10 kW dynamos. In 1931 Barrow Corporation bought out the company and operated the station as an independent generating point. By 1932 a Francis reaction turbine coupled direct to a three-phase 50-cycle 150 kW alternator was supplying a new a.c. four-wire network, though the Pelton wheel remained until all d.c. consumers had been transferred to the a.c. system. A 30 kW petrol-paraffin engine-driven alternator provided the first a.c. supplies and was retained for some time as a standby against drought. In 1935 the Barrow 11 kV lines were run to Coniston and stepped down to 400 V by a 300 kVA transformer, and in 1937/38 a second Francis turbine and 150 kW alternator were installed.

Originally all transmission and distribution was by overhead lines, but the revenue from Coniston village has enabled the 11 kV line to be replaced by underground cable. Similar replacement of 400 V overhead feeders is in progress.



150 kW hydro-electric set installed at Coniston

In 1944 the Barrow system was connected to the grid, enabling the Coniston station to work in parallel with the national supply. Previous local daytime demand was often far below the station capacity, but the Coniston generators are now run as near to full load as the water supply will permit. In the ten years since the second turbo-alternator set was installed, the plant has contributed an average of 1,085,500 kWh a year at 41.3 per cent load factor—about 2 per cent of the Barrow-in-Furness output. This represents an annual saving of 605 tons of coal, assuming a large steam station could deliver to Coniston and district 1 kWh for 1.25 lb of coal. Further development could treble the hydro-electric output. Such small supplies could be tapped at, perhaps, 5,000 points in the county as a whole between two high-voltage feeding points or towards the end of a long line, reducing loss due to voltage drop and increasing the capacity of local distribution lines.

The Coniston station draws water from reservoirs formed by two interconnected tarns. Sluices operated by the owners of slate quarries control the tarns, preventing the station from using their full storage capacity. Levers Water Tarn has a gathering ground of two to three square miles and a mean area of 28 acres; its level can be permissibly reduced by about 20ft. With a working head of 220ft this provides storage equal to 150

kW for 560 hr. The small Low Water Tarn higher upstream, which feeds the larger one, could have its flow diverted from the river into Levers Water Tarn and be kept dry during drought so as to absorb any sudden heavy rainfall. Water intake to the power station is easy, another advantage being the considerable drop to the tail race.

An attendant visits the station daily, leaving one or both sets running according to the state of the stream; installation and servicing work for consumers occupies the remaining three-quarters of his time. Protection to the pipe-line from stones and debris is given by a settling tank and screens. If much debris is brought down or snow packs into the strainer box, a short shut-down period is needed for cleaning. During storms some of the gravel carried down gets past the settling tank, but wearing rings fitted before the guide chambers protect these and the turbine runners and are renewed every five years, being the heaviest maintenance item.

The turbines are by Gilbert Gilkes & Gordon, and the alternators and switchboard by Metropolitan-Vickers. Governing is by Gilkes patent oil-pressure governors driven by belt from the main turbine shaft. Protection on generators and the interconnector is by M.-V. 3-pole induction-type overload relays with d.c. tripping from Nife batteries. Incoming and running voltmeters and synchronizing equipment are on a separate panel on the power-house wall. The installation, completed in 1939, cost £6,602 including plant and mains, switchgear, civil engineering and buildings; no reservoir construction was needed, but the tarns had to be connected to the pipe-line and over 1,300ft of pressure piping was laid.

During the financial year ended 31st March, 1946, the plant generated 972,951 kWh, of which 498 was used on works. The works cost (£204) was 0.2169d per kWh to feeders, allocated as follows: Oil and stores, 0.0017d; salaries and wages, 0.0363d; repairs and maintenance, 0.0124d. Capital and administration charges (£674) were, per kWh: Interest, 0.0195d; sinking fund, 0.1176d; insurance, 0.0168d; management, 0.0084d; rents and rates, 0.0042d. A similar plant could probably be put to work to-day for £45 per kW and would have at least 50 years' economic life.

The author is indebted to Mr. C. T. S. Arnett, Controller of the North-Western Division of the British Electricity Authority, and to the technical staff of the Barrow undertaking for their co-operation in the preparation of this article.

Lighting Restrictions Relaxed

MR. GAITSKELL'S ANNOUNCEMENT

REPLYING to a question in the House of Commons last Friday, Mr. Gaitskell, Minister of Fuel and Power, said that he was satisfied that the improvement in the coal situation now justified the removal of the restrictions on the use of electricity for shop window, advertisement and display lighting outside peak hours. It had been agreed with the British Electricity Authority that the extra coal to be used in consequence by the power stations should be of inferior quality and mainly take the form of "untreated smalls." This type of coal, which was the one most commonly used at present in generating electricity, had been available for domestic consumers "off the ration" for some time; and he was assured by the National Coal Board that the additional supplies required could now be provided without endangering the export programme.

Since shop window advertisement and display lighting was most unlikelv to increase the risk of load shedding during the summer months, there would be no restrictions at all on the use of electricity for these purposes from 2nd April to 2nd October. From then on, however, and throughout next winter, in view of the continued danger of load shedding, it would be prohibited on week days from 7 a.m. to 7 p.m.

He had also decided, after consulting the Minister of Transport, that street lighting should no longer be limited to 75 per cent of the pre-war standard. There might, however, be some cases where the public lighting authorities were not able to increase the standard of street lighting at once, partly because the equipment might need repair and replacement and partly because where streets were lit by gas, local conditions might make it difficult for the gas undertakings to meet the additional load.

COMMERCE and INDUSTRY

Labour for Power Plant : Public Speaking Awards

THE Ministry of Labour's return of vacancies filled in "first preference" industries during the four weeks to 19th January shows that 496 men and 85 women went to the production of generating plant for electricity undertakings, 564 men and two women to power station construction, and 761 men and five women to Scottish hydro-electric schemes.

Welding Exhibition

The Engineering and Marine Exhibition at Olympia, which will be held from 25th August to 10th September next, will again incorporate the Welding Exhibition, occupying the annexe at the south end of the Grand Hall. Almost all manufacturers of welding equipment will be exhibiting there, but a feature of particular interest will be a stand 90ft long occupied by the principal resistance welding machine manufacturers who are members of B.E.A.M.A. This stand will show examples of work fabricated by resistance welding, ranging from flash butt welded rails to small spot-welded pressings, and from jet engines to handles of saucepan lids; the purpose of the exhibit will be to show the range of work which can be resistance welded, and to indicate the savings in manufacturing costs and the greatly increased production speeds which can be obtained by proper use of the resistance welding processes.

State Impact on the Professions

Mr. C. R. Heathcock, president of the Chartered Institute of Secretaries, and member of the Midlands Electricity Board, addressing a gathering of South African professional men in Cape Town on 11th March, reviewed the impact of socialization upon the professions in Great Britain and urged the importance of the preservation of their status and integrity. Mr. Heathcock thought that the public corporation offered to the chartered secretary a new field with full scope for secretarial functions. Referring to accountancy, Mr. Heathcock said that the scale upon which the new public authorities were to operate was so great and the industries they administered so complex that there was bound to be an intense development of accounting for purposes of budgetary control and management.

Staff accountants were bound to be relied on to a large degree to provide financial information by which their far-flung operations could be properly managed and controlled. The demand for practising auditors would therefore be reduced, but that for internal or industrial accountants of high calibre would be markedly increased. There was one feature of the new order of things about which some people were not happy, the refusal of the Government to submit State trading accounts in several fields to Parliamentary scrutiny. This did not apply to the public corporations, which published full and detailed reports and accounts. If this policy was continued it would tend to weaken the professional status of the accountant who, as auditor in private enterprise, tended to fulfil the role of trustee for the shareholder.

Cable Specifications

The Departmental Committee concerned with the standardization of electrical cables and wires for use in Government services (secretary, Ministry of Supply, I.E.M.E., "Walsingham," Manor Park, Chislehurst, Kent) has recently issued a revised version of G.D.E.S.5 for telephone cables. The main change is that provision has been made for the introduction of p.v.c. as a sheathing material and of polythene as a dielectric. Copies of the document can be obtained for 6d from the Stationery Office.

E.D.A. Public Speaking Competition

The national finals in the E.D.A. public speaking competition for the commercial staffs of electricity supply undertakings was held at the Lighting Service Bureau, London, on 17th March, Mr. V. W. Dale, general manager and secretary, presiding. There were seven competitors in each of the sections for women and men. As was the case last year rural electrification was the favourite topic for discussion. Eight of the fourteen candidates spoke on "Lightening the Lot of the Rural Housewife," and the first three in the men's section all selected this subject. Four competitors spoke on "Spreading the Domestic Electricity Load" and one each on "Electrical Installations in New Houses" and "How Nationalization will Benefit the Consumer."

The successful competitors were: Women: 1, Miss D. E. Wagstaff (Northmet Sub-Area, Eastern Electricity Board); 2, Mrs. M. Alcorn (No. 1 Sub-Area, North-Western Electricity Board); 3, Miss M. Curtis (Southern Electricity Board, Newbury). Men: 1, Mr. J. Spencer (North-Eastern Electricity Board, York Sub-Area); 2, Mr. W. S. Smith (headquarters

staff, Merseyside and North Wales Electricity Board, Liverpool); 3, Mr. A. Ritchie (Glasgow Sub-Area, South West Scotland Electricity Board).

The judges in the women's section were the Dowager Lady Swaythling, president of the E.A.W., Mr. F. Phillips of the B.B.C., and Mr. H. T. Young, past-president of the I.E.E. Men competitors were adjudicated on by Alderman Mrs. Amy Woodgate, Deputy Mayor of Surbiton, Mr. F. Grisewood, B.B.C., and Mr. J. W. Thomas, education officer, B.E.A.

Soil Warming Display

The Bath Service Centre of the South-Western Electricity Board recently staged a soil warming display which aroused considerable interest among commercial growers and householders with garden cold frames and greenhouses. The display, which lasted a fortnight, consisted of cold frames and adjustable cloches, and included a greenhouse with propagating bench. The cold frames were sectioned, one half showing lettuce growing in soil and the other the arrangement of the wires and connection to low voltage transformers. Time switches and electric soil sterilizers were also on view.

Part of the soil warming exhibit in the Bath Service Centre

E.D.A. Scottish Lunch

Speaking at the annual luncheon of the Scottish Area Committee of the British Electrical Development Association in Glasgow on 15th March, Mr. J. Eccles, chairman of E.D.A. Council, said that when the power station was built at Dalmarnock between the two wars the average cost worked out at £15 per kW; for the new station at Braehead they would be fortunate if the cost was less than £45 per kW. Coal had more than trebled in price, labour costs were up by 90 per cent yet, in comparison with the increased prices for other commodities electricity was still a cheap product, even in Glasgow. The differential price between winter and summer was not a money-making thing from the point of view of the Electricity Board, but was intended to break even. It had proved to be very objectionable, and nobody regretted it more than he did. It was a Government decision to operate the plan, however, and as law-abiding people they had done so. The toast of the Association was proposed by Dr. P. Dunsheath who spoke of the great need for education and the important part played by E.D.A. in encouraging the development of everything electrical. Mr. W. S. Sawtell, chairman of the Scottish Area Committee, presided at the luncheon and introduced the principal guests, who included Mr. A. E. MacColl (North of Scotland Hydro-Electric Board), Mr. J. S. Pickles, Mrs. MacColl and Lady Rosebery.

Electrical Progress in Canada

Reviewing the electrical manufacturing industry at the beginning of the year, Mr. H. M. Turner, president, Canadian General Electric Co., Ltd., said that the use of electricity in Canada had doubled every ten years since 1919, when records first became available. Although this trend might not be maintained indefinitely, it was reasonable to expect that it would continue for at least the next decade. This increasing demand must be met by a parallel development of power production facilities.

Electrical manufacturers had expanded their facilities to provide as rapidly as possible the equipment required in 1949 as well as that ordered for installation in 1950, 1951 and subsequent years. The gross value of production in the electrical manufacturing industry in 1948 was estimated to be about $400 million, which was nearly 10 per cent greater than in 1947 and well over four times 1939 production. Present indications were that this high level of activity would be continued through 1949.

Mr. R. A. Harkness, president of the Northern Electric Co., has stated that, while there might be some increases and decreases in the prices of various products in 1949,

it was not anticipated that there would be any radical change in the overall price levels nor in the physical volume of business.

Mr. Crawford Gordon, Jr., president, English Electric Co. of Canada, has expressed the view that despite continued shortages in many materials the Canadian production curve would continue to rise in the coming year. Many industrial concerns which have been waiting for prices to drop before enlarging their facilities are finding their present quarters inadequate to handle even a reasonable part of their demand and, therefore, have been forced to take immediate action. The greatest problem of suppliers of heavy electrical equipment would be to meet a continued demand brought on by the need for greater central station capacity throughout Canada. Meeting this demand would be complicated by shortage of steel.

Fens Sub-Area

The Fens Sub-Area headquarters of the Eastern Electricity Board will be at Milton Hall, Milton, nr. Cambridge (telephone: Cambridge 58361) from Monday next. For the time being the sub-area engineer and his staff will remain at the Electricity Offices, St. Neots, Hunts.

New Zealand's Electrical Imports

During the first three quarters of 1948 electrical imports into New Zealand amounted in value to £6,094,000, an increase of £1,000,000 on the corresponding period of 1947. Such details as have been published by the Dominion Government are given in the accompanying table.

Class	Jan.—Sept.	
	1947 £	1948 £
Storage batteries ...	27,900	28,300
Electric ranges	50	1,400
Lamps	57,100	102,500
Other elecl. machinery and equipment ...	4,672,000	5,633,400
Radio sets	4,200	5,065
Valves	102,700	64,900
Other radio apparatus	224,100	258,300

The item of £1,400 under electric ranges represents the value of 44 units. The number manufactured in New Zealand during that period was 14,454 compared with 13,941 during the same period of 1947.

Iranian Electrical Imports

A large increase in electrical imports into Iran (Persia) is shown by the official trade returns for 1946-47 issued in Teheran. There had already been (in 1943-44) a marked recovery in the imports of telegraph material, cables and consumption goods such as radio receivers, lamps, meters and batteries (but not accumulators). Since 1944 the advance has spread to power plant, accumulators, electrical equipment for vehicles, fans, telephone apparatus, and a wide range of domestic appliances, while the cable and radio trade has made further progress.

Washing Machine Exports

Britain's electric washing machine exports in 1948 were more than 107 times the value of 1938 exports—£1,132,240 compared with £10,500 worth.

Yarrow South African Company

Yarrow & Co., Ltd., Glasgow, have formed a new subsidiary, Yarrow (Africa) (Pty.), Ltd., Johannesburg, which is also registered in Southern Rhodesia. This has become necessary to deal with the increasing volume of overseas business in Yarrow land type water tube boilers for power stations, steelworks and other industrial plants.

Advertisement Correction

We are asked to say that while the trade name "Lewmex" was correctly given in the centre of the advertisement of the London Electric Wire Co. & Smiths, Ltd., in our 18th March issue (p. 123) it was misspelt in the text as "Lewmax."

Trade Announcements

E. K. Cole, Ltd., announce the appointment of Mr. G. R. Wibrow as technical sales representative for "Thermovent" heating in the South London area and South-Eastern Counties. Mr. Wibrow will operate from the company's London office, 5, Vigo Street, W.1.

From 25th March, the address of the Birmingham premises of **Foster Electrical Supplies, Ltd.,** will be 24, St. Paul's Square, Birmingham.

Mr. P. D. Hallifax has been appointed representative for **Metropolitan Distribution, Ltd.,** to the electrical, radio and motor trades, in the Exeter area.

Concrete Utilities, Ltd., northern area sales office has moved to 11, Albert Square, Manchester (telephone: Blackfriars 9377).

Works Visit

On 10th March, a number of generation engineers and power station superintendents spent the day at the factory of Ferguson, Pailin, Ltd., where they were able to see all types of indoor and outdoor low-voltage and high-voltage switchgear in course of construction. The visit was arranged by Mr. J. W. Thomas, chief education and training officer, B.E.A., and the party numbered forty-seven in all including

Mr. R. H. Coates, Divisional Controller, Southern Division. The visit was included in the programme of the conference which was taking place at Haddon Hall Hydro (Electricity Hall), Buxton. Mr. G. A. Cheetham, managing director of the company, welcomed the visitors and said that he felt much good would result from the mutual interchange of ideas as between the supply industry and the manufacturers. Mr. Coates responded.

Large American Winder for Coal Board

A mine winder which cost £90,000 to build, has been purchased from the United States by the National Coal Board for less than a third of that amount. It is to be installed at the Barnborough Main Colliery, Yorkshire. The winder has two rope drums each 19ft 8in in diameter and 7ft 11in wide, operated by 1,750 h.p. motors. The plant includes two 1,250 kW d.c. generators and a 6,000 V, 3,500 h.p. main generator-driving motor.

Drying Cabinet Price

We regret that in the 18th March issue (p.457) the purchase tax upon the Casson clothes dryer and airer was incorrectly given. The amount is £11 8s 1d, not £18 8s 1d.

Catalogues and Lists

Ferranti, Ltd., Hollinwood, Lancs.—Technical brochure describing the type FK d.c. ampere-hour meter.

Watson & Sons (Electro-Medical), Ltd., Sunic House, Parker Street, Kingsway, London, W.C.2.—Technical brochure on X-ray equipment for radiography and therapy.

Time Switches & Instruments, Ltd., Bovey Tracey, Newton Abbot, Devon.—Priced leaflet on time switches.

Saxon Components, Ltd., 66, Victoria Street, London, S.W.1.—Catalogue of fluorescent lighting fittings.

Belling & Lee, Ltd., Cambridge Arterial Road, Enfield, Middlesex.—Catalogue of radio components and accessories.

The Belmos Co., Ltd., Bellshill, Lanarkshire.—Technical folder on automatic contactor starters of up to 150 A capacity at 650 V.

Selyac Distributors, Ltd., Forde Road, Newton Abbot, Devon.—Folder describing the "Selyac Junior" domestic mixing machine.

Watliffe Co., Ltd., Lombard Road, Morden Road, South Wimbledon, London, S.W.19.—Leaflet on commutators and slip rings.

West Indies Trade

DURING the period of import control which was rendered necessary by the dollar shortage, British West Indian purchases from Canada were reduced by about one-third and the United Kingdom rose to the position of chief supplier, although prices of some of her goods were considered high. Dollar exchange was made available at that time only for the purchase of essential goods that could not be obtained from the sterling-area countries. Now, by arrangement between the Governments of Canada and the United Kingdom, electrical household appliances, equipment, wiring devices and parts are listed among numbers of articles in respect of which some relaxation of British West Indian exchange control restrictions will be made.

Importers may accordingly resume limited trade with exporters in the United States as well as with other countries outside the sterling area. The quantity of each line of goods to be imported under the new arrangement will be determined by the authorities of each individual colony. Exchange licences granted under this arrangement will be valid for imports from any hard currency country at the importer's option.

Jamaica's dollar expenditure on electrical goods and apparatus in 1948 totalled $589,000, compared with $1,173,000 in 1947. The island's dollar deficit as a whole was last year approximately halved. With a view to diversifying the island's economic assets new industries are being encouraged by concessions in import duty on the necessary equipment and in taxation. In a report at the end of January, the Canadian Government Trade Commissioner at Kingston referred to some accumulation of stocks arising from slackening in trade. He said that accounts were not being met as promptly as they were a year ago, but added that some improvement in the situation could be expected with the start of the new sugar season.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Honia" heat-controlled irons.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Supplementing Waste Heat

RECOVERY FROM DIESEL GENERATING PLANT

SO-CALLED "waste" heat recovery from diesel engine plant is the subject of a paper presented by MR. T. R. HOUSTON (English Electric Co., Ltd.), to the Diesel Engine Users' Association last week.

Principles are outlined with graphical representation of the proportions utilized and lost. After stating that the average user is content with the output of the electrical generator, for which he claims an efficiency of 35 per cent at full load, the author illustrates graphically what can be gained by generating steam at 30 lb/sq in from the exhaust gases and recovering heat from the cooling water in the engine jackets.

One of five ways of making up deficiencies of recovered heat is the employment of electric immersion heaters, either in the engine exhaust heater, or in a separate thermal storage vessel or supplementary heater. Contrary to the usually accepted idea, this method is described as extremely efficient. When applied in conjunction with a full heat-recovery circuit the immersion elements increase the load on the engine and thereby add to the waste heat available, an amount generally appreciably greater than the heat equivalent of the electrical element rating, especially at the higher loads.

The thermal efficiency of the electrical heating must, therefore, be more than double the generating efficiency from about five-eighths to full load, which means more than 70 per cent; actually it is rather more than 80 and may reach 90 per cent over the lower portion of the load range. These increases are explained in detail graphically in the paper.

An additional advantage of electric heating in this way is that it is a convenient method of efficiently balancing load by levelling out fluctuations of normal electrical loads, avoiding light load periods. The immersion elements can be switched thermostatically, but their kW capacity must not be chosen arbitrarily.

In a supplement to the paper the author calculates that a heat pump driven by a diesel engine with fuel oil at £10 a ton would be very much more economical in fuel cost than the same heat pump driven by a motor with electricity at 1d per kWh purchased from the public mains.

Factory Power Supply

OPERATION OF PRIVATE GENERATING PLANT

THE generation and use of electricity in a large factory were discussed by MR. O. LYLE (director, Tate & Lyle, Ltd.) in an address to the March meeting of the Association of Supervising Electrical Engineers.

A factory would only generate its own power if it were large enough to do so more cheaply than it could purchase energy, or if it were necessary to avoid frequently fluctuations and possible interruptions.

Too much power margin should not be allowed for in designing the installation, because large amperage required heavy cables and large switchgear. High voltage had advantages in respect of switchgear and distribution cables, but it was extremely expensive. The lecturer was not at all sure that the electrical industry was not taking the easy way by requiring industrial concerns to generate at 6.6 kV to reduce currents, instead of concentrating on the production of switchgear capable of breaking 15,000 A at 440 V.

Control gear generally was becoming complicated, expensive and often bigger than the machine it controlled. Because a.c. did not afford satisfactory speed variation machine-tool makers had to use gear boxes of great complexity and cost. The Ward-Leonard system was expensive and occupied space that was not always available. The best speeds for many factory machines could be determined only by experiment after installation, while many operatives were able to run their machines a good deal faster than their neighbours. A cheap and flexible drive would increase production. One could not simply compare the costs of a.c. and d.c. motors, for the latter must bear their share of the cost of converting plant.

Mr. Lyle thought too much had been made of the danger of running private generating plant in parallel with the public supply system. He mentioned a case in which the back-pressure turbine did not drive a generator but a large induction motor that was tied permanently to the public mains. When over-driven the machine generated its share of the factory load and returned surplus power to the public mains. There was a case for parallel operation in this way, provided the machine did not have to carry too large a proportion of the factory load.

Apart from cost comparisons the lecturer

mentioned a number of the many ways in which power could be saved. For example, the installation of contactor control for changing over from 50 to 25 c/s four distant vacuum pumps, thereby gaining 100 kW at a capital cost of £7 per kW. Also, by using spare oversize motors in star instead of delta, incidentally helping the power factor. By reducing every machine to the lowest speed at which it would properly do its work, as much as 600 kW was saved in one case.

Idle load could waste much power; a test case showed the average load to be 2,700 kW whereas 420 kW represented the work actually done. Most factory machines were unlikely to average more than 20 per cent of their efficiency.

Next Week's Events

Monday, 28th March

BIRMINGHAM.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Radio Group. Informal lecture on "Television Developments," by Dr. K. R. Sturley.

BRISTOL.—Grand Hotel, 6 p.m. I.E.E. Western Utilization Group. "The Design of Contactors with regard to their Industrial Application," by B. Feldbauer.

Tuesday, 29th March

CAMBRIDGE.—Cambridgeshire Technical College, 6 p.m. I.E.E. Cambridge Radio Group. Informal lecture on "Printed Circuits, including Miniature Components and Sub-Miniature Valves," by J. E. Rhys-Jones and G. W. A. Dummer.

LEEDS.—Lecture Hall, City Museum, 7 p.m. I.E.E. North Midland Centre. Film on "Atomic Physics."

LONDON.—At the Royal Society of Tropical Medicine and Hygiene, Portland Place, W.1. 6.30 p.m. "Modern Permanent Magnets for Instruments," by D. A. Oliver and D. Hadfield.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1., 5.30 p.m. Institute of Fuel, "The Efficiency of House Heating," by Dr. J. C. Weston.

LUTON.—Girls' High School, Alexandria Avenue, 7.30 p.m. Luton Technical Society. "Thermostatic Control," by F. L. Tester.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. "The Measurement of Light and Colour," by G. T. Winch.

NEWCASTLE-ON-TYNE.—City Hall, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture on "Television" by Sir Noel Ashbridge and H. Bishop.

Wednesday, 30th March

CARDIFF.—South Wales Institute of Engineers, 6.30 p.m. I.E.E. Cardiff Students' Section. "Patents and the Electrical Engineer," by L. H. A. Carr.

LONDON.—Café Royal, W.1., 6.30 for 7 p.m. I.E.E. Supply Section. Dinner-dance.

L.T.R. Headquarters Refreshment Club, 8th Floor, Waterloo Bridge House, S.E.1., 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. "Transmission Performance —Introduction and Application to Subscribers' Network," by G. A. E. Fudge.

Institute of Metals. Annual general meeting at the Institution of Mechanical Engineers, Storey's Gate, S.W.1., on Wednesday and Thursday, and at 4, Grosvenor Gardens, S.W.1., on Friday.

SCUNTHORPE.—I.E.E. Sheffield Sub-Centre, 7 p.m. "Speech Communication under Conditions of Deafness or Loud Noise," by Dr. W. G. Radley.

Thursday, 31st March

BRISTOL.—The University, 7 p.m. I.E.E. Bristol Students' Section. The Students' Lecture, "Patents and the Electrical Engineer," by L. H. A. Carr.

LONDON.—Savoy Place, W.C.2., 5.30 p.m. Institution of Electrical Engineers. "Overhead Line Regulations," by H. W. Grimmitt.

Friday, 1st April

HARROGATE.—Grand Hotel, 7.30 for 8 p.m. I.E.E. North Midland Centre. Annual dinner and dance.

LONDON.—Caxton Hall, S.W.1., 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "Protective Gear," by T. E. Hayes.

39, Victoria Street, S.W.1., 6.30 p.m. Junior Institution of Engineers. Films, "Kelvin, Master of Measurement," and "Kelvin Hughes Marine Radar."

At the Royal Society of Arts, John Adam Street, Adelphi, W.C.2., 7 p.m. Institution of Electronics, "A Survey of Shock Therapy," by A. MacPhail.

Saturday, 2nd April

LONDON.—I.E.E. London Students' Section, 2.30 p.m. Visit to B.B.C. Monitoring Station, Tatsfield, Surrey.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers, which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

Fiji Islands.—A firm of general merchants, importers and distributors in Suva wishes to contact manufacturers of electrical accessories, domestic appliances, wires and cables, lighting fittings, etc. Also interested in the supply of spare parts for both American and English refrigerators at present in use in the Islands. (X.205).

Electricity Supply

Generation in February : S.E. Board and Domestic Development

THE monthly statistical statement issued by the Ministry of Fuel and Power shows that 4,242 million kWh was generated during February compared with 4,231 million kWh in the corresponding month last year, an increase of 0.3 per cent. The accompanying table gives further details, including kWh sent out, plant capacity, and fuel consumed.

	Fuel Consumed thousand tons		kWh generated million			kWh sent out million	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water Power	Total†		
British Electricity Authority	2,467	3.5	4,086	40	4,139	3,905	12,923
North of Scotland*	16	0.9	25	75	103	102	327
Total for February, 1949	2,483	4.4	4,111	115	4,242	4,007	13,250
Total for February, 1948	2,521	3.9	4,086	128	4,231	3,999	12,955
Per cent increase or decrease on 1948	− 1.5	+ 12.8	+ 0.6	− 10.2	+ 0.3	+ 0.2	+ 2.3

* Including North of Scotland Hydro-Electric Board and Lochaber Power Co.
† Including generation by other means amounting to 18.2 million kWh in February, 1949.

During the week ended 11th March the output from solid-fuel-fired stations amounted to 1,011.3 million kWh, compared with 960.9 million kWh (revised figure) in the preceding week and 798.0 million in the week ended 13th March, 1948. Stocks of coal at electricity undertakings at 12th March aggregated 3,276,000 tons.

Electricity for Exmoor

At a farmers' meeting at Dulverton, Som., Mr. V. J. Collins, M.P. for Taunton, stated that the South Western Electricity Board had decided to embark on a scheme for supplying electricity to most of Exmoor. Work was expected to start shortly on a cable between Minehead and Dulverton, linking many of the outlying villages and farms.

S.E. Consultative Council

At the first public meeting of the South Eastern Electricity Consultative Council last week, Councillor M. A. Bulloch, chairmain, said that the Council welcomed members of the Press as it was necessary to inform the public through the Press of the actions taken by the Council to safeguard consumers' interests. Reviewing the work of the Council to date, he said it had set up five district committees, and the scheme for the operation of the Council had been approved by the Minister of Fuel and Power. Of a population of over three millions in the South-Eastern Electricity Board's area, 890,000 were consumers. The Area Board had stressed that there was no reason why there should not be an extended use of electricity for all domestic purposes outside the peak periods, and every encouragement should be given to the off-peak use of domestic apparatus. The Board stated that deliveries of electrical apparatus and appliances were improving and consideration was being given to the introduction of an extended payments scheme for the purchase of apparatus.

Aberdeen Lighting Costs

A report by the Aberdeen superintendent of lighting, submitted to the Watching and Lighting Committee, estimates that street lighting will cost 86.3 per cent more under the charges imposed by the North of Scotland Hydro-Electric Board than in a normal year before 1st April, 1948.

Sodium Lighting Installation

Wilmslow, near Manchester, has been equipped recently with sodium street lighting covering about 2½ miles of road. For this installation the General Electric Co., Ltd., supplied 53 type Z.9425 lanterns and "Osram" 140 W sodium lamps, together with the 25ft concrete columns. Special attention was paid to the siting of the columns so that they should not be too obtrusive in a setting which has earned for Wilmslow the name of "the largest village in England." The light distribution of the Z.9425 lantern with its horizontally burning lamp is particularly helpful on broad roads.

In this installation the average spacing of the columns is about 140ft, giving about 4,400 lumens per 100ft of carriageway.

Street Lighting Conversion

Dagenham Highways Committee reports that estimates have now been received from the Eastern Electricity Board for the supply and erection of equipment for the second stage of the major road lighting conversion schemes. The Committee favours the use of Siemens "Euston Sieray" lanterns. The estimated cost of the programme is £13,400.

Eastern Board and Farmers

Members of the Eastern Electricity Board recently met representatives of the National Farmers' Union county branches in the area to tell the farmers what had been done and was being done towards electrification of the country districts.

It was pointed out that the available supplies of materials limited what could be accomplished in the next year or so, and the Board's policy was, therefore, to undertake first those extensions which would provide the greatest number of new supplies for the least expenditure of materials. During the first ten months of its existence the Board had made new supplies available to over 1,000 farms.

Although the national policy in the matter was not yet settled, the Board, as an interim measure, had abolished capital contributions and minimum guarantees for new supplies, though in many cases a special quarterly charge would be made for a limited period of five years. It was explained that to electrify the whole area was going to cost many millions of pounds, and if this electrification was to be a success it was necessary that farmers should make full use of the electricity supply for farming purposes as well as for domestic use, although they should help to avoid load shedding by using low-loading and "off-peak" appliances wherever available for farm purposes.

Swiss Power Shortage

Switzerland, like Britain and other countries, has its electric power crisis. It was expected that, as a result of measures taken to increase output, 70 per cent of the demand for electricity would be met this winter. When this estimate was made, however, it was not foreseen that lack of rainfall would reduce the volume of water in the rivers to an unprecedented extent. Consequently restrictions on consumption had to be imposed. In reporting this situation the Swiss Bank Corporation says that hydro-electric projects on a sufficiently large scale have not been found possible, but that efforts have been directed towards the construction of medium-sized plants, the building of thermal stations, and the arrangement of contracts for the import of power.

Mining Industry Reconstruction

CADMAN MEMORIAL LECTURE

THE reconstruction of the mining industry in Britain was the subject of the second of the Cadman Memorial Lectures, which was delivered last week before the Royal Society of Arts.

The joint authors (father and son, both previously with the Fife Coal Co.) were Sir Charles Reid, formerly production member of the National Coal Board, and Dr. William Reid, production director, Scottish Division, N.C.B.

They commenced with an examination of some of the facts of the industry, now in its third phase, when a very small part of the remaining reserves of coal lay close to the surface and much of the medium depth reserve was exhausted, so that dependence would be more on seams lying more than 2,000ft deep. Many collieries and seams in others had outlived their usefulness.

The lecturers proceeded to discuss the means of concentration into the most productive units so as to increase the efficiency of the labour force. Further mechanization at the face, reorganization elsewhere underground and reconstruction on the surface should enable the average daily output per colliery to be substantially increased by 1965. But the number of collieries would have to be considerably decreased, despite the new ones to be opened up and the drift mines to be developed.

Reallocation of manpower, assuming that present wage levels would be maintained, should automatically raise the average wage due to higher piecework earnings. The cost of mining stores should also fall with the price of coal and that of power consumed should be reduced by more economical use of inbrought power.

Price reduction would depend upon increasing the output of coal per manshift in the ways indicated, but time would be required to train a sufficient number of mining engineers and, further, the capital involved was so immense that it must be expended gradually, otherwise the whole national economy would be thrown out of balance.

FINANCIAL SECTION

Company News
Stock Exchange Activities

Reports and Dividends

The Westinghouse Brake & Signal Co., Ltd., held its annual meeting on 15th March, Capt. A. R. S. Nutting (chairman) presiding. In his statement, circulated with the report and accounts, the chairman says that the company's order book remains satisfactory and the prospects, judging from existing orders on hand, the value of inquiries received, and the volume and value of tenders submitted, are good. It is proposed to increase the authorized capital from £1,200,000 to £1,500,000 and also to increase the borrowing powers of the board from the present limit of an amount equal to the issued capital up to one and a half times that capital. The board does not consider the present or the immediate future opportune for raising the permanent capital, and it prefers borrowing on a medium-term basis. Addressing the meeting, Capt. Nutting said that since the issue of his statement a loan of £750,000 had been obtained on an unsecured note bearing interest at the rate of 3½ per cent.

Following the annual meeting, an extraordinary meeting was held at which resolutions were passed increasing the authorized capital to £1,500,000 by the creation of 300,000 new shares of £1 each, adopting new articles of association and authorizing the conversion into stock of any shares when issued and fully paid or credited as fully paid up.

The British Aluminium Co., Ltd., reports a profit for 1948 of £1,860,142, as compared with £2,132,812 for the preceding year, which with £332,703 brought in makes £2,192,845. From this is deducted directors' fees, profits and income tax, debenture interest, depreciation, reserve for increased cost of plant replacements, etc. The final ordinary dividend is unchanged at 6 per cent, again making 10 per cent for the year, and the balance carried forward is £358,952.

The British Engine, Boiler & Electrical Insurance Co., Ltd., reports income from premiums, etc., of £1,431,394 for 1948, and claims and other outgoings of £1,266,799, and after providing for unexpired risks, the profit is £111,126 (against £117,926). The final dividend is 17s per share, less tax, making 34s per share for the year (same), and £356,833 is carried forward (against £343,433 brought in).

Lancashire Dynamo & Crypto, Ltd., in a preliminary statement, reports a net profit, after income tax, of approximately £130,000 for 1948, as compared with £104,125 for 1947. It is proposed to pay a second interim dividend and bonus of 17½ per cent on the ordinary, again making 22½ per cent for the year.

A. F. Bulgin & Co., Ltd., report a profit for the period of one year and twelve days ended 31st January last, of £49,328. The dividend for the period is 27½ per cent, provision for taxation is £27,514, and £1,457 is written off preliminary expenses, leaving £5,231 to be carried forward.

In his statement, Mr. A. F. Bulgin says that the period covered by the accounts was difficult due to several alterations in the rates of purchase tax. Though a number of cancellations of orders were received, the company's products were used by many trades and industries not affected to any great extent, and the directors concentrated the activities of the sales organization upon such unaffected trades. Export sales have greatly exceeded anticipation.

The South African Electricity Supply Commission is to raise £3,000,000 in 3½ per cent stock, 1969-74, at par, for the repayment of temporary loans and further expenditure on power station extensions. The loan, which will be a local operation, will be offered for public subscription on 28th March.

The Watford Electric & Manufacturing Co., Ltd., has announced a final ordinary dividend of 10 per cent, plus a bonus of 5 per cent, making 20 per cent for the year (against 15 per cent). The net profit for 1948, after taxation, is £19,887, as compared with £15,821 for 1947.

Aberdare Cables, Ltd., has announced a second interim dividend 9 per cent. (to be regarded as final), making 15 per cent. for the year (unchanged).

New Companies

E. Walker & Co. (Electrical Engineers), Ltd.—Registered 11th March. Capital £10,000. Subscribers: G. F. Shipman and F. R. Furber. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Murphy Radio (Ireland), Ltd.—Registered in Dublin 22nd February. Capital, £5,000. Subscribers: Miss Mary Sheehy, 10, Mount Street Crescent, Dublin, and J. Maybury, 19, Botanic Avenue, Glasnevin, Dublin.

Utilectric, Ltd.—Registered 10th March. Capital £100. Manufacturers, retailers, exporters and importers of immersion heaters, electrical and mechanical equipment, etc. Directors: W. A. Roe and S. Wienholdt. Regd. office: 32, Downing Street, Manchester, 1.

Teal and Shaw, Ltd.—Registered 11th March. Capital £3,000. To acquire the business of wireless and electrical engineers and gramophone and music dealers, carried on by J. Shaw at 13, George Street, Halifax. Directors: J. Shaw and Mrs. Barbara Shaw. Regd. office: 13, George Street, Halifax.

Domestic Motors, Ltd.—Registered 16th March. Capital £1,000. Importers, exporters, wholesalers and retailers of electrical motors and accessories for sewing machines, electrical goods and appliances, etc. Directors: J. Stephen and E. H. Joyce. Regd. office: 18, Nightingale Lane, S.W.12.

John E. Hemming (Electrical), Ltd.—Registered 16th March. Capital £2,000. Electricians, electrical, wireless and refrigeration engineers, etc. Directors: J. E. Hemming, Rita M. Hemming, and Lucy C. Barnes. Regd. office: 124, High Street, Smethwick, 41.

L. Parker, Ltd.—Registered 15th March. Capital £1,500. To acquire the business of an electrical contractor and engineer carried on by L. Parker at Hall Green, Birmingham. Directors: L. Parker, E. M. Parker, and W. H. Fitter. Regd. office: 88, Bushmore Road, Hall Green, Birmingham, 28.

Gresham Electrical Co., Ltd.—Registered 15th March. Capital £10,000. To acquire the business of an electrical wholesaler and distributor carried on by A. O. Rixon, at 17, Percy Street, W.1, as the Gresham Electrical Co. Directors: A. O. Rixon, C. A. Rixon, and E. O. Rixon. Regd. office, 17, Percy Street, Tottenham Court Road, W.1.

Westmorelands (Electrical Contractors), Ltd.—Registered 22nd February. Capital £100. Directors: E. H. Westmoreland, K. G. Westmoreland, G. R. Westmoreland and A. J. Westmoreland. Regd. office: 33a, Market Place, Melton Mowbray.

Wm. Don, Ltd.—Registered 26th February. Capital £500. Electricians, industrial, electrical, mechanical, automobile and general engineers, etc. Subscribers: A. F. Trigg and C. W. K. Parrish. Solicitors: W. & G. Burr Sugden & Co., 6-8, Devonshire Street, Keighley.

Increase of Capital

Concordia Electric Wire and Cable Co., Ltd.—Increased by £100,000 in 100,000 unclassified shares of £1 each, beyond the registered capital of £100,000.

Liquidations

Radio & Electrical Supplies (Staffs), Ltd.—Creditors' voluntary winding-up. Liquidator, Mr. R. E. Clark, 17, Albion Street, Hanley, Stoke-on-Trent, appointed 11th March.

Lissen, Ltd.—Members' voluntary liquidation. Meeting of members on 18th April at 1, Bowman's Place, London, N.7, to receive an account of the winding-up by the liquidator, Mr. C. E. M. Emmerson.

Winding-up Order

G. & G. Electrical Engineers, Ltd.—In the Companies' Court, on 21st March, Justice Roxburgh made an order for the compulsory winding-up of the company. There was no opposition.

Bankruptcies

F. Robinson, residing at 46, Glovers Road, Small Heath, Birmingham, and lately carrying on business at 100, Henshaw Road, Small Heath, Birmingham, as a refrigerating and electrical engineer.—Receiving order made 15th March on debtor's own petition.

L. A. R. Batchelor, 25, Eversley Road, St. Leonards-on-Sea, and trading as Kenex Distributors, 139, Bohemia Road, St. Leonards-on-Sea, electrical and radio equipment wholesalers, formerly 3, Mercatoria, St. Leonards-on-Sea, and 72, High Street, Hastings.—Receiving order made 15th March on debtor's own petition.

A. H. Banwell, residing at 32, New Fosseway Road, Knowle, Bristol, and carrying on business at 4, Dominion Road, Fishponds, Bristol, electrical and radio retailer.—First meeting 25th March at the Official Receiver's offices, 26, Baldwin Street, Bristol. Public examination 10th June, at the Guildhall, Small Street, Bristol.

B. Barnett, residing at 2, Station Road, Manor Park, lately residing at 163, Avenue Gardens, Ilford, and lately carrying on business at 29, North Street, Barking, and 317, Roman Road, Bow, E., electrical engineer.—Order made 10th February, 1949, suspending discharge for two years and six months until 10th August, 1951.

J. W. Johnson, 34, Lacey Gardens, Louth, Lincs, electrician, and lately carrying on business at Newbridge Hill, Louth, Lincs.—First and final dividend of 1s 6¼d in the £, payable 24th March at the Official Receiver's office, 8, Flottergate, Great Grimsby.

C. R. A. Chadfield, residing at 13, Albert Street, and carrying on business at 12, Nottingham Street, Melton Mowbray, Leics, electrical engineer.—Supplemental dividend of 19s 3d in the £, and 4 per cent statutory interest, payable 30th March at the Official Receiver's office, 1, Wycliffe Street, Leicester. Receiving order and Order of Adjudication dated 26th February, 1923, rescinded on 9th March, 1949, on the grounds that all debts have been paid in full, together with all costs, charges and expenses.

STOCKS and SHARES

THE strong rally which occurred in Stock Exchange markets after the extreme flatness which overcast stocks and shares last week, was due in the main to a little investment support and to bear covering. Markets nowadays are so thin and sensitive that it takes but a small amount, either of buying or selling, to exercise a disproportionate effect upon prices, though the previous slump certainly saw a good deal of selling on the part of investment which had become scared by the political and financial outlook, not only at home, but on the Continent and in the United States.

That the "shake-out" in prices had no reference to any lack of money has become obvious through the magnitude of the subscriptions offered to new issues, several being greatly over-subscribed. The bout of selling which culminated in the slump gave way to a more settled feeling. Complaints are daily heard in the Stock Exchange of business quietude, but it can safely be said that markets are now in a less nervous condition. The fall undoubtedly served to bring in numbers of purchasers who were attracted by the low levels to which many prices dipped.

Brush Electric Dividend

Conditions gave little opportunity for a market response to the return of Brush Electrical Engineering to the dividend list after a three years' absence. The 10 per cent payment applies to £800,000 ordinary capital, which will now be doubled as a result of the issue of stock to Associated British Engineering in part consideration for Brush's two new subsidiaries. Addition of the latter's profits to the Brush company's own revenue for the year gives a total of £900,000, which exceeds by £100,000 the estimates published at the time of the merger. It was proposed then that as soon as the 1948 accounts had been settled, the question of forming some £1½ million permanent capital should be reopened. The subsequent behaviour of markets has been anything but helpful in this respect. Meanwhile the 5s ordinary are quoted 3d better at 6s 9d and the 5½ per cent preference stand at 18s 9d ex dividend.

Lodge Plugs

This company's 5s ordinary shares were given a favourable reception on their introduction to the industrial market a week ago. Dealings began at 25s; the price has kept steady since the shares came to market. At 25s the yield works out at about 5½ per cent on the prospective 30 per cent dividend. This rate has been paid for the three post-war years, with a 15 per cent interim on account of the year ending this month.

The particulars published last week showed last year's profits as £124,000, before tax, equal to practically 50 per cent on the £250,000 capital, all of which is in ordinary stock. Recent sales of sparking-plugs, it was stated, have been half as much again as the 1939 figures. Progress is not expected to make much further headway in prevailing circumstances, and profits for the year about to end are estimated as likely to be similar to the previous figure. The intention is to declare the final dividend about September next.

After the Slump

Where almost every change in our list of prices has been downward since a week ago, and in some cases substantially, it seems almost unnecessary to attempt any lengthy catalogue of to-day's quotations. Amongst the heaviest falls on the week, however, were those of 5s in Lucas and Murex at 82s 6d. and 90s respectively, Lucas afterwards rallying to 85s. Falls of ½ made Revo 55s, and Lancashire Dynamo 5¼. The latter company announces increased profits; the year's dividend is again 22½ per cent. Ericsson Telephones at 41s 3d are ex dividend, allowing for which the price is about 3s lower on the week. Globe Telegraph ordinary receded 2s to 45s. Great Northern Telegraphs at 15 are 30s down. Overseas electricity supply shares are mostly lower, the weakness affecting more particularly the Indian group.

C. A. Parsons at 63s 6d are 9d better, while Telephone Rentals at 10s 6d, and Oriental Telephones at 48s 9d also show improvement. Mather & Platt, 50s, and Greenwood & Batley, 53s 6d, are harder on the week.

Extent of the Fall

This representative table shows the extent of the damage experienced by a variety of electrical shares since the beginning of last month:—

Ordinary Share	Price 1st Feb.	Now	Fall
A.E.I.	80/–	75/–	5/–
B.I.C.	35/3	31/6	3/9
Crompton P.	28/–	24/6	3/6
Cossor	10/9	8/6	2/3
E.M.I.	20/–	18/–	2/–
Decca	20/3	17/–	3/3
Henley's	26/3	23/6	2/9
Tel. Constr.	51/3	46/3	5/–
G.E.C.	91/6	86/6	5/–
Auto. Tel.	64/6	62/–	2/6
J. Lucas	91/–	85/–	6/–

Spanish Electrical Trade

LARGE POWER DEVELOPMENT SCHEMES

IN his report on "Economic and Commercial Conditions in Spain," dated April, 1948 (published for the Board of Trade by H.M. Stationery Office at 3s net), Mr. J. Walker, O.B.E., Counsellor (Commercial), H.M. Embassy, Madrid, states that in 1944 Unidad Electrica S.A., an association grouping all the main producers of electricity in Spain, was set up to establish a form of grid. The various private companies producing electricity also embarked on large construction programmes. Spain's total capacity, which in 1939 was in the region of two million kVA, had risen in 1947 by only 200,000 kVA, but it is hoped that by 1953 further plant with a total capacity of 2,400,000 kVA will have been brought into service. The proportion between hydro-electric and thermal stations is 80 per cent and 20 per cent respectively.

In addition to these programmes the Instituto Nacional de Industria, a semi-Government body set up to promote industrial development, hopes to put into service plant with a capacity of 400,000 kVA by 1953, while it has a long-term plan for a further increase of 200,000 kVA.

Local Industry

The electrical engineering industry has 50,000 employees. Production includes alternators up to 10,000 kVA, cables for voltages up to 50,000, meters, electric locomotives, insulators for up to 60 kV, motors, switchgear up to 66 kV and transformers. Shortage of materials, however, makes it necessary to import many of these products. Steam turbines and hydro-electric turbines are generally imported.

There has been a considerable development in the manufacture of light equipment since the end of the civil war, and local production of such goods as batteries, lamps, wiring and domestic electrical equipment is able to cope with local needs.

The telecommunications industry includes several concerns connected with large British, American and Dutch companies and these firms are able to meet the bulk of the demand for the armed forces and of the merchant service. No radar equipment is produced and production of radio-testing equipment is limited. Wireless receivers are built by a large number of small firms whose combined output is between 40,000 and 50,000 sets a year. Most of the parts are manufactured in Spain but some components are imported and less than a quarter of the valves required are produced. Much of the exchange and transmission equipment for both telegraphs and telephones has to be imported into the country.

Dealing with trade prospects, Mr. Walker says that there appears to be no prospect of any imports of domestic electrical appliances on a substantial scale in the next few years. Local manufacture of fluorescent lighting fittings is limited and considerable interest is shown in Spain in this form of lighting for domestic uses and there may later also be a market for street lighting of this type. At present import licences are only available for the necessary powders and occasionally for small quantities of lamps without mountings.

Demand for Heavy Equipment

There is likely to be a large and lasting import demand for heavy electrical equipment, the bulk of the licences granted being for the heaviest types of generators, turbines, transformers and switchgear. Exchange difficulties have hampered Swiss and American imports and the United Kingdom has been getting a steadily increasing share of the trade. Apart from specialized cables, and some high-grade insulators, the demand for distribution equipment is met in Spain.

In the trade for telecommunications apparatus, United Kingdom equipment has come well to the fore in recent years and this country and the United States are the principal suppliers. There is likely to be a valuable volume of business in coming years as regards telephone exchanges, telegraph and multi-channel transmission apparatus and radio equipment. There is no prospect of any import licences being granted in the foreseeable future for domestic radio receivers, but licences for certain components, particularly valves, are likely to be granted. There should eventually be a good market for echo-sounding and radar equipment, and, in the more distant future, a market for both high-frequency heating equipment and electronic equipment for control purposes.

A good opportunity exists for developing the trade in scientific and measuring instruments, local manufacture of which is still in the early stages.

Platinum Electrodes

IN the past many types of platinum electrodes have been developed for use in electro-chemical analysis. A 20-page booklet issued by Johnson, Matthey & Co., Ltd., 73-83, Hatton Garden, London, E.C.1, provides the analyst with details of those which are at present available, with some indication of the advantages and limitations of each design.

Crystal Valves

Their Construction Simply Explained

By "PHYSICIST"

THE crystal detector was the heart of the simpler radio receiver in the twenties. The thermionic diode had already been invented, but an appreciable degree of amplification of the aerial signal is required before it can be used as the detector in a radio circuit. With the advent of triode detectors the crystal became obsolete, but it has always had the advantage of simplicity, consisting in its earlier form simply of a crystal of galena or some other mineral soldered or clamped to a metal base, with a "catswhisker" of thin wire making contact with a point on the surface.

During the war, crystal diodes made a dramatic come-back in radar and other ultra-high-frequency applications. Even the smallest thermionic diodes have appreciable capacity effects, and electrical "noise," increasing with frequency, limits their usefulness when small voltages have to be detected or mixed. The silicon diode had already been used in some ultra-high-frequency work and it was produced in large quantities from 1943 onwards. It was found that very small additions of boron (0.001 per cent) to highly purified silicon enhanced its performance to a very marked extent. A small rectangular crystal of the boron-doped silicon was soldered to a plug which screwed into the end of a ceramic cartridge. The catswhisker, of 0.003in. or 0.005in. tungsten wire, electrolytically pointed, with a double kink in it to impart spring pressure, was soldered to a similar plug which was screwed into the body until contact was made. The ceramic cartridge was then filled with grease through a small hole in the side to provide mechanical stability and wire "pigtail" leads were usually clamped on to both ends. The whole unit was about $\frac{3}{4}$in long and less than $\frac{1}{4}$in dia., while its capacitance was only 0.5 pF.

Germanium Diodes

These silicon diodes suffered from the disadvantage that quite small inverse voltages caused burn-out of the point contact. Consequently other materials were examined and it was found, in an investigation at Purdue University, U.S.A., into the usefulness of germanium, that diodes using a crystal of this material could safely withstand a peak inverse voltage of 80-100 V when very small quantities of doping agent (such as tin) were added and could also pass continuously up to 50 mA. (See also *Electrical Review*, 9th April, 1948, p. 563.) The inverse characteristic is of curious form, in that the current and voltage rise to a peak and then the current continues to increase, but the voltage decreases. This is thought to be due to heating effects at the point contact.

Crystal Triodes

Possessing as these crystal diodes do the advantages of small size and absence of thermal delay, a.c. hum and noise due to heated filaments, it was natural that attempts should be made to produce a crystal diode. Success at the Bell Telephone Laboratories was announced last autumn (see *Electrical Review*, 10th September, 1948, p. 387). At a Press demonstration a complete superheterodyne radio receiver was shown in which all the "tubes" had been replaced by crystal triodes. The name given to them is "transistor" (transfer resistor).

The assembly follows the general lines of the crystal diode. Two catswhiskers are mounted on the germanium crystal with a separation of only 0.005in. to 0.01in. The catswhiskers may be of tungsten or some softer metal like phosphor bronze. The "emitter," which corresponds to the grid of a thermionic triode, is biased a fraction of a volt positive with respect to the base contact, while the "collector," corresponding to the anode, has a negative standing bias of about 20 V. Oscillating voltages applied to the emitter give rise to currents in the surface carried by "positive holes," which exist in the continuous distribution of electrons rather as a bubble

exists in a volume of liquid. When these currents arrive at the collector electrode they interact with the current flow of electrons from the base to the collector in some way that is not yet fully understood, but the net result is that a power gain is obtained. Voltage gains of up to 30 db can be obtained and a current gain of 3 to 1 is possible. The power consumption is very small (less than a watt) and the supply voltage required can be reduced in some cases to 5 or 10 V. The transistor can deliver 25 mW and will operate up to a few Mc/s in frequency. The output impedance is high and it can therefore be matched with a high impedance load.

The transistor is less than six months old and development is undoubtedly proceeding rapidly. Probably specialized types will be developed for particular applications, as has happened in the case of thermionic valves. It is early yet to predict its future, but it may lead to revolutionary changes in electronic equipment.

Clothes Wash-boilers

Curious Cause of Laundry Staining

By E. A. ROBBINS

SHOWROOM managers and superintendents of maintenance concerned with appliance-hire schemes may like to be guided by the following incident relating to a household wash-boiler of 10 gal. capacity, electrically heated, with a water container made of sheet copper tinned inside.

About three years ago a consumer complained that her wash-boiler was causing stains to appear on some of her "washing" and inspection showed that part of the tinning had worn off the bottom of the boiler, the interior being otherwise exceptionally clean and bright.

The boiler was removed to the works and several pieces of cloth were boiled in it without any sign whatever of staining. It was consequently assumed that the stains previously noticed had not been caused by any defect of the boiler, which was accordingly returned, untouched, to the consumer. Several months later a further complaint was received that stains were again appearing on garments which, in parts, were discoloured a pastel shade of pink.

I therefore approached a chemist friend of mine and asked for his advice. After inspection and applying certain tests to one of the discoloured glass cloths he informed me that the marks were copper stains.

When further tests were made it was clear that the washing powders used by the consumer did not, alone, cause any staining. If, however, a quantity (even a very small amount) of invert sugar such as that contained in jam, marmalade, honey, etc., were present in addition to the washing powder then certain chemical reactions could occur with respect to the copper boiling pan, causing stains.

My chemist friend concluded his summing up with an explanation that due to the presence of invert sugar, or similar reducing compounds, in the boiler during the process of boiling clothes, garments which came into contact with bare copper parts of the container could be stained. Even perspiration (if it contained invert sugar) on underclothes being boiled could account for the stains.

What puzzled me most was the fact that several months had elapsed between the receipt of the first and second complaints. From further investigation I learned that the consumer's husband was in the habit of consuming moderate amounts of beer daily, but that he had been off work due to a serious illness during the period between the receipt of the initial and final complaints. I also discovered that the husband did perspire quite a good deal.

There is the possibility that honey or jam had accidentally been dropped, say, on to a tablecloth before it was washed. Anyway the wash-boiler pan was retinned, since when there has not been any further complaint.

Tees-side Trolley-buses. — Middlesbrough Town Council is supporting the plans of the Tees-side Railless Traction Board to operate trolley-buses in the Grangetown area in view of the extensive housing developments.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1944

21367. British Thomson-Houston Co., Ltd.—Electric control circuits for supplying current to a reactive load. 1st November, 1943. (619040.)

21481. Stevens, A. H. (Submarine Signal Co.).—Submarine signalling apparatus. 2nd November, 1944. (618945.)

1945

8794. Sperry Gyroscope Co., Inc.—Motor control systems and circuits particularly for positional and velocity control. 8th April, 1944. (Cognate applications 8795/45, and 8796/45.) (619041.)

12328. British Thomson-Houston Co., Ltd.—Cemented carbide piston rings. 19th May, 1944. (618946.)

14148. Rothfuchs, A.—Branch box for electric distribution systems. 5th June, 1945. (618857.)

20087. Evans, I. M.—Electric motors. 4th August, 1945. (619216.)

20371. Compagnie Générale d'Electricité. Method of and means for identifying defective apparatus. 4th December, 1944. (619217.)

22620. Radio Rentals, Ltd., and Welch, W. P. C.—Radio receiving apparatus. 3rd September, 1945. (618859.)

24157. Marconi's Wireless Telegraph Co., Ltd.—Radio frequency field responsive devices. 31st March, 1944. (618860.)

26492. Dykes, W. U. (Steinhoff, J. R.).—Method of and apparatus for radio direction finding. 10th October, 1945. (618951.)

29336. Automatic Signal Corporation.—Apparatus for detecting the occurrence of a sequence of events. 21st December, 1944. (618952.)

29797. Soc. Anon de Télécommunications.—Device for the transmission of calling and clearing signals in long-distance telephonic circuits. 22nd April, 1943. (619043.)

32744. Igranic Electric Co., Ltd.—Electric motor and like controllers. 4th December, 1944. (618863.)

1946

622. Marconi's Wireless Telegraph Co., Ltd.—Ionization gauges suitable for leak detection in evacuated systems. 31st January, 1945. (619133.)

950. Landis & Gyr Soc. Anon.—Instrument or measurement transformer for metering, regulating and controlling, and more especially useful for remote control purposes. 12th January, 1945. (618956.)

1630. Electro Methods, Ltd., Butcher, F. E., and Willheim, R.—Electric control arrangements, employing saturable reactors. 17th January, 1946. (618957.)

1665. Soc. Savoisienne de Constructions Electriques.—Means for drying immersed electrical apparatus. 17th January, 1945. (618868.)

6122. M-O Valve Co., Ltd., and Ramsay, H. T.—Electric-discharge devices and incandescent lamps. 27th February, 1946. (619050.)

7135. Cossor, Ltd., A. C., Williams, B. C., Fleming-, and Wynn, A. H. A.—Non-sinusoidal electron-discharge valve amplifiers. 7th March, 1946. (618871.)

9177. Sadir-Carpentier.—Navigation - aiding radio systems. 30th March 1945. (618873.)

9845. Goss Printing Press Co., Ltd.—Electric printing systems. 27th April, 1945. (619225.)

10068. Hivac, Ltd., and Goulding, F. A.—Manufacture of cathode of thermionic valves. 1st April, 1946. (619136.)

10301. Metropolitan-Vickers Electrical Co., Ltd., and Gurney, N. R. D.—Control systems for electrically operated reversible rolling mills and the like. 3rd April, 1946. (618875.)

12976. Philips Lamps, Ltd.—Circuits for generating high-frequency oscillations. 31st January, 1942. (619228.)

13322. Metcalfe, C., and Sexton, R.—Sockets for electron-discharge tubes. 2nd May, 1946. (618964.)

13530. Lister & Co., Ltd., R. A., and Attwood, F. A.—Automatic starting systems for engine-driven electric generators. 3rd May, 1946. (618877.)

15565. Soc, Française Radio Electrique.—Alternating-current synchronizing apparatus. 2nd June, 1945. (618880.)

16220. Gresham Transformers, Ltd., Clegg, J. A., and Locke. R. A.—Current collecting apparatus. 28th May, 1946. (619056.)

16548. Philips Lamps, Ltd.—Circuits for the stabilization of the mean frequency of a frequency-modulated oscillation. 24th March, 1942. (619139.)

16938. Philips Lamps, Ltd.—Devices for the diaphragm-control of X-rays. 21st March, 1942. (619057.)

17448. Metropolitan-Vickers Electrical Co., Ltd., and Woosey, E.—Dynamo-electric machines. 11th June, 1946. (619058.)

17999. Standard Telephones & Cables, Ltd., Shepard, S. C., and Wolfson, H.—Electric thermally sensitive resistance elements. 14th June, 1946. (618966.)

18852.—Standard Telephones & Cables, Ltd.—Electro-mechanical time-delay devices. 9th July, 1945. (618881.)

18889. Lombard, A. A.—Gas turbine plants. 24th June, 1946. (Cognate application 29570/46. (619232.)

19270. Sperry Gyroscope Co., Inc.—Electric control or amplifier systems. 24th July, 1942. (619062.)

19753.—Submarine Signal Co.—Magnetostriction oscillators. 18th June, 1941. (618884.)

21971. Marconi's Wireless Telegraph Co., Ltd., and Mortley, W. S.—Piezo-electric crystal circuit arrangements. 23rd July, 1946. (618967.)

22931. Philips Lamps, Ltd.—Devices comprising electric-discharge tubes. 29th October, 1942. (619066.)

26795. Bendix Aviation Corporation.—Electro-mechanical transducer. 10th September, 1945. (618973.)

27383. Precision Developments Co., Ltd., and Rossz, L.—Electric contact devices applicable to electric follow-up switches. 12th September, 1946. (618899.)

28249. Philips Lamps, Ltd.—Electric-discharge tubes and incandescent lamps. 6th April, 1943. (619148.)

28521. Automatic Electric Laboratories, Inc.—Telephone systems. 24th September, 1945. (619073.)

28912. Philips Lamps, Ltd.—Ultra-high-frequency electric circuits. 29th March, 1943. (619149.)

28915. Philips Lamps, Ltd.—Photo-electric devices. 6th April, 1943. (618976.)

29235. Western Electric Co., Inc.—Automatic telephone system. 22nd May, 1940. (618900.)

29423. Philips Lamps, Ltd.—Electric-discharge tubes. 6th October, 1945. (619151.)

31054. Standard Telephones & Cables, Ltd.—Electrical control system. 3rd November, 1945. (619077.)

31596. General Electric Co., Ltd., and Morris, F. H.—Infra-red electric heating apparatus. 24th October, 1946 (618978.)

31709 Standard Telephones & Cables, Ltd., and Ridler, S.—Electrical storage of information. 25th October, 1946. (619155.)

32445. Muller, H.—Electric fuses or cut-outs. 1st November, 1946. (619239.)

33314. Cossor, Ltd., A. C., and Moss H.—Radio frequency modulators. 8th November, 1946. (619156.)

33635. Hole, S., and Bugden, H. H.—Electrically driven vehicles. 12th November, 1946. (618919.)

33651. Cole, Ltd., E. K., Ripley, R. V., and Jackson, W. J. C.—Clock-controlled electric switches. 13th November, 1946. (618921.)

33654. Hulsmann, Jun., W. C.—Bent or profiled elements for indirect lighting fittings. 24th November, 1938. (618922.)

33665. Black & Decker Manufacturing Co.—Switch assembly for portable electric tool. 18th June, 1946. (618924.)

33674. General Electric Co., Ltd., and Baldock, F. G.—Machinery guards. 13th November, 1946. (619081.)

33730. British Thomson-Houston Co., Ltd.—Anode structures for X-ray generators. 13th November, 1945. (619083.)

33735. Parsons, C. S. (Elcalor Akt.-Ges. Fabrik für Elektrothermische Apparate).—Rotary electric switches. 13th November, 1946. (618930.)

33785. Telegraph Condenser Co., Ltd., and Cozens, J. H.—Capacitors. 14th November, 1946. (618934.)

33832. Stuart, J. F. W., and Norton, F. D.—Electric striking or alarm clocks. 14th November, 1946. (618938.)

33841. British Thomson-Houston Co., Ltd.—High-frequency thermocouples. 15th November, 1945. (619157.)

33844. Holophane, Ltd. (Holophane Co., Inc.).—Light refracting and transmitting plates and equipment using the same. 14th November, 1946. (619084.)

33890. Scholes & Co., Ltd., G. H., and Pearce, F. J. —Electric plug-and-socket couplings. 15th November, 1946. (618941.)

33892. Electric Furnace Co., Ltd. (Ohio Crankshaft Co.).—Welding. 15th November, 1946. (618979.)

33953. Philips Lamps, Ltd.—Circuit arrangements for acting upon the natural frequency of an oscillatory circuit by means of a variable reactance. 6th May, 1943. (619085.)

33977. Maschinenfabrik Oerlikon.—Electrically driven vehicles. 15th August, 1946. (618986.)

34018. Bickell, S. F.—Thermally actuated electric switches with magnetic snap-action. 16th November, 1946. Cognate application 26337/47.) (618989.)

34185. Bisset Industries, Ltd., and Lees-Andrews, R. S.—Electro-magnetically operated starter switches for single-phase electric motors. 18th November, 1946. (619089.)

34187.—Riseley, W. B.—Electric garden frame heater. 19th November, 1946. (619004.)

34269. British Thomson-Houston Co., Ltd., and Jefferson, H. F.—Means for simultaneously and individually controlling the speeds of rotating devices or machines. 19th November, 1946. (619010.)

34271. British Thomson-Houston Co., Ltd.—Control of dynamo-electric machines. 5th March, 1942. (619011.)

34299. London Passenger Transport Board, and Readman, A.—Protection of direct-current electrical feeders. 19th November, 1946. (619015.)

34304. Bendix Aviation Corporation.—Electric inductor alternators. 21st December, 1945. (619093.)

34335. Brooke, W., and Baldwin, H. T.—Control of direct-current motors by means of grid-controlled rectifiers. 20th November, 1946. (619094.)

34347. Cole, Ltd., E. K., Inskip, F. A., Cuerden, T. G., and Atkinson, N. T.—Mounting of focusing magnets for cathode-ray tubes. 20th November, 1946. (619097.)

34434. Wadsworth & Sons, Ltd., W., and Kerse, W. H.—Control of electric lift motors. 20th November, 1946. (619025.)

34479. Brush Electrical Engineering Co., Ltd., and Banks, J. W.—Turbine blading. 21st November, 1946. (619107.)

34544. Philips Lamps, Ltd.—Back-coupled, low-frequency tube oscillators. 18th June, 1943. (619111.)

34636. Sulzer Frères Soc. Anon.—Gas-turbine plant. 22nd December, 1945. (619114.)

34686. Etablissements Merlin & Gerin.—Elecrtic fluid blast circuit-breakers. 3rd December, 1945. (619243.)

34756. Marconi's Wireless Telegraph Co., Ltd.—Electric telegraph systems. 23rd November, 1945. (619122.)

34911. British Thomson-Houston Co., Ltd.—Electric heaters. 27th November, 1945. (619180.)

34927. Philips Lamps, Ltd.—Electro-dynamic pick-ups. 9th July, 1943. (619182.)

34928. Philips Lamps, Ltd.—Electric-discharge tubes. 10th July, 1943. (619183.)

35031. Standard Telephones & Cables, Ltd., Fearon, J. H., Stray, W. J., and Metcalf, J. C.—Electrical condensers. 26th November, 1946. (619193.)

35078. Philips Lamps, Ltd.—Circuit arrangements for generating voltages varying linearly with time. 8th June, 1943. (619199.)

35124. Townsend, C. M., and Townsend, C. R.—Portable appliances for supporting and displaying by electrical illumination astronomical or other data. 27th November, 1946. (619203.)

35176. Aktiebolaget Separator. Suspension arrangement for flexible conductors, pipes and the like. 29th November, 1945. (619209.)

35182/3. Metropolitan-Vickers Electrical Co., Ltd., and Ludlow, J. H.—High-frequency heating processes. 27th November, 1946. (619211 & 619244.)

35184/5. Metropolitan-Vickers Electrical Co., Ltd., and Ludlow, J. H.—High-frequency electrical power supply systems. 27th November, 1946. (619245 & 619246.)

35190. Westinghouse Electric International Co.—Power transmission devices. 27th November, 1945. (619247.)

35191. Westinghouse Electric International Co.—Current collectors. 12th December, 1945. (619248.)

35202. Telefonaktiebolaget L. M. Ericsson.—Processes for the production of electric cables. 28th November, 1945. (619249.)

35237. British Insulated Callender's Cables, Ltd., Shaw, J. D., and Davies, R. L.—Cored solders. 27th November, 1946. (619252.)

35406. Cole, Ltd., E. K., and Kemp, R.—Device for transforming electrical energy into the momentum of a rotary shaft. 29th November, 1946. (619268.)

35408. M.P. Stainless Products, Ltd., and McLeman, W.—Electric fires. 29th November, 1946. (619269.)

35409/10. M.P. Stainless Products, Ltd., and McLeman, W.—Electric reflector fires. 29th November, 1946. (619270.) (619271.)

35411. M.P. Stainless Products, Ltd., McLeman, W., and Thompson, J. F.—Electric immersion heaters. 29th November, 1946. (619272.)

35474. M-O Valve Co., Ltd., and Woodville, G. R. —Thermionic valve oscillator circuits. 29th November, 1946. (619278.)

35475. General Electric Co., Ltd., and Smith, J. F.—Soldering aluminium and alloys thereof. 29th November, 1946. (619279.)

35476. General Electric Co., Ltd., and Smith, J. F. —Uniting of metals. 29th November, 1946. (619280.)

35507. Metropolitan-Vickers Electrical Co., Ltd., and Turnbull, J. S.—Manufacture of wax articles. 29th November, 1946. (619286.)

35537. Standard Telephones & Cables, Ltd., and Grayson, H.—Beat frequency oscillators. 30th November, 1946. (619288.)

35541. Marconi's Wireless Telegraph Co., Ltd.—Electrical shields. 30th November, 1945. (619290.)

35543. Whipp & Bourne, Ltd., and Whipp, I. T. L. —Electric relay devices. 30th November, 1946. (619291.)

35546. Birlec, Ltd., and Harris, J.—Furnaces for the heat treatment of materials. 30th November, 1946. (619292.)

1948

14984. Electro Methods, Ltd., Butcher, F. E., and Willheim, R.—Electric control arrangements employing saturable reactors. 17th January, 1947. Divided out of 618957. (619037.)

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of 16th March:—

MILREX.—No. 670,168. Class 9. Electric conduit material, connections, contacts, distribution boards and boxes, switches, fuse boxes, terminals and junction boxes.—Charles Miller, trading as Miller Brothers, 30-32, Beaverbank Place, Edinburgh, 7.

MORRISON.—No. B637,894. Class 12. Electrically driven goods-carrying road vehicles.—A. E. Morrison & Sons, Ltd., Webb Lane, Hall Green, Birmingham, 28.

H.S. (design).—No. B666,268. Class 12. Electrically propelled road vehicles, and parts thereof included in Class 12.—Hindle, Smart & Co., Ltd., 20, Wilmslow Road, Withington, Manchester, 20.

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Barrowford.—11th April. U.D.C. Electrical work in connection with alterations to "Park Hill," Colne Road. F. Highfield, surveyor, U.D.C. Offices, Nelson.

Buckley.—11th April. U.D.C. Electrical installations in 18 Council houses at Victoria Avenue. Surveyor, U.D.C. Offices.

Bury.—18th April. Corporation. Internal fire alarm system and intercommunicating telephone systems at the new Town Hall (see this issue).

Denbighshire.—Education Authority. Contractors wishing to tender for heating and hot water installations and electric lighting installations at the new primary school at Towyn and a three-classroom hutment at Llanrwst Grammar School should submit their names by 18th April. (See this issue.)

Edinburgh.—North of Scotland Hydro-Electric Board. Transformers for rural distribution. (See this issue.)

Hertfordshire.—County Council. Contractors wishing to tender for building and maintenance work should apply to the Clerk of the County Council (18th March).

Hull.—7th April. Corporation and Haltemprice U.D.C. Sewage pumping plant complete with electric motors, starting equipment, switchgear, etc., Contract No. 2a. City Engineer, Guildhall.

Pakistan.—KARACHI.—15th June. Director General, Supply and Development. Two 5,000 kW turbo-alternator sets, complete with switchgear, boiler and condensing plant, etc. Tender forms and specifications from Pakistan High Commissioner in London.

Southampton. — 15th April. Corporation. Electrical installations in 94 houses. (See this issue.)

Stone (Staffs).—4th April. U.D.C. Installation of an electric submersible pump, with depth indicator and switchgear, at Longton Road Waterworks. Engineer, Town Hall.

Orders Placed

Bath.—Corporation. Recommended. Electrical installations in Cornish unit houses (£6,290).—Colston Electric Co., Bristol. Electrical work at the Moorlands Infants' School (2,487).—H. L. Bush & Co., Bath.

Birkenhead.—Welfare Committee. Rewiring Eastham House (£512).—C. J. Roberts & Co.

Doncaster.—Corporation. Standby generating set, Bossington Bridge pumping station (£7,056).—Associated British Oil Engines.

Leicestershire.—County Council Standing Joint Committee. V.h.f. police wireless station, Bardon Hill (£1,693).—F. A. Wenster, Ltd., Leicester.

Littlehampton.—U.D.C. Housing Committee. Electrical installations in 58 houses, Lyminster Road (£1,572).—H. F. Lillywhite.

London.—Electrical installation at Laburnum Street School, Shoreditch.—Archibald Saville & Co.

Middlesbrough.—Education Committee. Installation of electric heating at the Brambles School (£950).—Graham Brothers.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Billinge.—Houses (80), Claremont estate, for U.D.C.; J. M. Wilson & Son, architects, 2, Naylor Street, St. Helens, Lancs.

Billingham-on-Tees.—Houses (68), Roseberry Road area, for the U.D.C.; Kitching and Co., architects, 21, Albert Road, Middlesbrough.

Brighton.—Factory, Westgate Road; Disabled Persons Employment Corporation, Ltd., 25, Buckingham Gate, S.W.1.

Bristol.—Locomotive shed, staff quarters, etc., Avonmouth Dock (£82,000); city engineer.

Shops and offices, Lockleaze; Thomas Barrett, surveyor, 50, Pall Mall, S.W.1.

Bromley.—Houses (102) Coppice estate; borough surveyor.

Burnley.—Central transport garage, Pilling Mill Fields site (£55,000) and houses (340) Brunshaw estate; borough engineer.

Bury.—Central omnibus station; J. Chadwick, borough engineer, Bank Street.

Caterham.—Houses (54), Mill House estate, for U.D.C.; engineer and surveyor.

Colchester.—Offices (£12,250), Park Avenue; H. Conolly, county architect, Essex County Hall, Chelmsford.

Crook (Co. Durham).—Houses (50) for U.D.C.; J. Twiname, builder, Cockermouth.

Darlington.—Factory additions, Neasham Road; W. Richardson & Co., Ltd., heating engineers,, North of England Horticultural Works.

Daventry.—Shops and houses, Braunston Road estate; F. A. Coles, architect, Market Place, Long Buckby.

Derbyshire.—Grammar school, Hope Valley; F. Hamer Crossley, county architect, St. Mary's Gate, Derby.

Eccles.—County primary school, Alder Park estate; Willink & Dod, architects, Cunard Building, Liverpool 3.

Edinburgh.—Extension of creamery, West Bryston Road (£25,000); Edinburgh and Dumfriesshire Dairy Co., Ltd., Harrison Park Creamery, 11.

Edinburgh.—Houses (76), Broomhouse; St. Andrew's Housing Association, Ltd., 27, Alva Street.

Enfield.—Houses (53), Durants Road site; Wates, Ltd., builders, 1258, London Road, S.W.16.

Eston.—Houses (42), Eston No. 4 housing estate; N. C. Harrison, U.D.C. surveyor.

Great Yarmouth.—Houses (40), Magdalen College site; borough surveyor.

Hainault.—Forest secondary school (£122,000); Yorke, Resenberg & Mardall, architects, 35, Welbeck Street, W.1.

Hampshire.—Second instalment of Manor Park Secondary School, Aldershot, Bridgemary Primary School, Gosport, and erection of Christchurch Infants' School; county architect, The Castle, Winchester.

Harlow (Essex).—Scheme for 500 houses, Mark Hall estate; Harlow Development Corporation, Seeleys, London Road, Harlow.

Heanor.—Houses (40), Marlpool site, for U.D.C.; R. Archer, surveyor, Council Offices.

Hereford.—Fire station (£25,000); county architect, Bath Street, Hereford.

Hillingdon.—Primary school (£121,700), county architect, Middlesex House, Vauxhall Bridge Road, S.W.1.

Kirkby Stephen.—Secondary school; R. H. Crompton, Westmorland county architect, County Hall, Kendal.

Lancashire.—Extensions to Technical Colleges Lytham-St.-Annes (£72,205), and Leigh (£64,800); G. Noel Hill, county architect, Preston.

Llanelly.—Re-employment factory; Ministry of Works, 43, Park Place, Cardiff.

London.—Extensions at Borough Polytechnic, (£130,000); Norman and Dawbarn, architects, 5, Gower Street, W.C.1.

BATTERSEA.—Factory and office reconstruction, Lombard Road, S.W.11; W. Carson & Sons, Ltd., paint manufacturers, Grove Works.

WOOLWICH.—Development of Barnfield Gardens Estate, Wrottesley Road, for flats, laundry, clubroom, etc., (£272,240) for L.C.C.; director of housing, County Hall, Westminster Bridge, S.E.1.

Margate.—Reconstruction of shops, offices, etc., Jetty Approach; Margate Pier & Harbour Co., Pier Office.

Melton Mowbray.—Houses (40), Asfordby and Nottingham Roads; Culpin & Son, architects, 3, Southamptom Place, W.C.1.

Merton.—Two blocks of 22 flats each, Malden Way, for U.D.C.; Albert J. Thomas, architect, 31a, Sloane Street, S.W.1.

Middlesbrough.—Houses, Thorntree estate; Whitehead & Son, builders, Middlesbrough (20 houses), and E. Buxton & Co., builders, Middlesbrough (18 houses).

Milford Haven.—Houses (112), Observatory site, for U.D.C.; engineer and surveyor.

Morpeth.—Houses (50), Broomhill, for R.D.C.; R. Carse & Son, builders, Amble.

Newcastle-on-Tyne.—New schools under further education programme (£380,000); city architect (education section), 31, Northumberland Road.

Northampton.—Houses (28), Winchester Road, and two factories and office block, Weedon Road; T. Wilson & Son, Ltd., builders, 67, Sheep Street.

North Riding.—New schools for the E.C. at Catterick, Redcar, Saltburn, and Scarborough; county architect, County Hall, Northallerton.

Oldham.—Extensions to Atlas Meter Works for George Orme & Co.; T. Partington & Sons, (Builders), Ltd., Palm Mill, Stocks Lane, Chadderton.

Openshaw.—Extensions to printing works for Gardiner & Co., (Manchester), Ltd.; Alan Wych, architect, 13, Hyde Road, Denton.

Pontllanfraith.—Hospital, Bryn site; Welsh Regional Hospital Board, Cathays Park, Cardiff.

St. Albans.—Houses (50) Sheephouse Farm estate, London Colney, for R.D.C.; architect and surveyor, 41, Upper Lattimore Road.

Salford.—Three-storey flats, Grosvenor Street and Bury Street; city engineer, Town Hall, Bexley Square.

Salisbury.—School, off Wilton Road (£34,204); F. I. Bowden, county architect, County Hall, Trowbridge.

Sedgley.—Houses (96), Turners Hill site; U.D.C. surveyor.

Selby.—Houses (44), Stainwer Wood estate, for U.D.C.; Blenkinsopp & Scatchard, architects, 22, Park Street.

Sheffield.—Special school for deaf (Maud Maxfield), Ringinlow; W. G. Davies, city architect, Town Hall.

Terraced dwellings, Littledale estate; city architect, Town Hall.

Shrewsbury.—Houses (100), Oakfield estate; borough surveyor.

Slough.—Secondary modern school, Stoke Road (£182,000); G. R. Crouch, county architect, County Buildings, County Hall, Aylesbury.

Smethwick.—Factory extensions; United Spring Co., Ltd., Hawthorne Street.

Southampton.—Junior and infants' schools, Weston Lane (£70,246); J. J. Udalls Building Co., West Quay Road.

Southend-on-Sea.—"Easiform" houses (225), Eastwood site; John Laing & Son, Ltd., builders, Mill Hill, N.W.7.

Stretford.—Rebuilding flour mill, warehouse and silo, Trafford Park; Hovis, Ltd., Union Road, Macclesfield.

Sunderland.—School, Hill View (£66,500); Myton, Ltd., builders, Hull.

Tottington.—Secondary school; Adshead, Topham & Adshead, architects, 31a, Broad Oak Road, Worsley, Manchester.

Tutbury.—Sewage pumping station, Rolleston, for R.D.C.; Willcox, Raikes & Marshall, engineers, 33, Gt. Charles Street, Birmingham.

Tynemouth.—Conversion of No. 2, Manor Road into nurses' training school for the Tynemouth Jubilee Infirmary (£10,000); R. Jordon, builder, North Shields.

Upton-on-Severn.—Houses (38), for R.D.C.; Pemberton & Bateman, architects, 21, Vine Street, Evesham.

Walsall.—Houses (54), Highfield housing site; M. E. Habershon, borough engineer.

Washington (Co. Durham).—Extensions to works, Washington Chemical Co.; Gordon Durham & Co., Boldon Road, East Boldon, Co. Durham.

Wath-on-Dearne.—Extensions to Grammar School, (£105,000); H. Bennett, West Riding county architect, Wakefield.

West Hartlepool.—Houses (46), Rift House estate; C. M. Yuill, Ltd., builders, Villiers Street, West Hartlepool.

West Bromwich.—Houses (30), Hateley Heath estate; borough engineer.

Bakery, Birmingham Road; S. Bradford & Sons, Ltd., 56, Norton Street, Birmingham, 18.

Factory, Bull Lane; Acme Spring Co., Ltd., 214, High Street.

Worcester.—Three storey office block, Castle Street; Worcestershire county architect, 60, The Tything.